UNITED NATIONS

MC

UNEP/MC/COP.2/5

Distr.: General
1 August 2018

Original: English

United Nations Environment Programme

Conference of the Parties to the Minamata Convention on Mercury
Second meeting
Geneva, 19–23 November 2018
Item 5 (b) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: environmentally sound interim storage of mercury other than waste mercury

Guidelines on the environmentally sound interim storage of mercury other than waste mercury

Note by the secretariat

1. At its first meeting, the Conference of the Parties to the Minamata Convention on Mercury considered the development of guidelines in relation to the environmentally sound interim storage of mercury other than waste mercury, as required pursuant to paragraph 3 of article 10 of the Convention. In its decision MC-1/18, the Conference of the Parties requested the secretariat to undertake further revision of the draft guidelines presented to the first meeting by seeking technical input from relevant experts, amending the guidelines and publishing the revised draft version on the Minamata Convention website for comment from experts, parties and others, and further revising the guidelines on the basis of the input received.

2. The secretariat has undertaken the revision as requested and is presenting the revised draft guidelines to the Conference of the Parties for further consideration and possible adoption. A draft decision in this regard is presented as annex I to this note, while the revised draft guidelines are presented as annex II.

Suggested action by the Conference of the Parties

3. The Conference of the Parties may wish to consider the revised draft guidelines on the environmentally sound interim storage of mercury other than waste mercury and adopt the guidelines for use.

* UNEP/MC/COP.2/1.

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Annex I

Draft decision MC-2/[XX]: Environmentally sound interim storage of mercury other than waste mercury

The Conference of the Parties,

Recognizing the need to assist Parties in the environmentally sound interim storage of mercury other than waste mercury through the provision of guidelines,

1. *Adopts* the guidelines on the environmentally sound interim storage of mercury other than waste mercury and calls on the Parties to the Minamata Convention on Mercury to take them into account in complying with their obligation to take measures to ensure that the interim storage of such mercury and mercury compounds intended for a use allowed to a Party under the Convention is undertaken in an environmentally sound manner;

2. *Notes* that the guidelines may need to be revised in the future to ensure that they continue to reflect best practice.

Annex II

Revised draft guidelines on the environmentally sound interim storage of mercury other than waste mercury

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I. Introduction

1. The Minamata Convention on Mercury is a global legally binding instrument with the objective of protecting human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention contains obligations relating to emissions and releases of mercury and mercury compounds resulting from all stages of the life cycle of mercury, including supply, trade, use, waste and contaminated sites. Specific obligations relating to the environmentally sound interim storage of mercury and mercury compounds other than waste mercury are set out in article 10 of the Convention. These obligations are different from the obligations for the environmentally sound management of mercury wastes, which are set out in article 11.

2. Article 10 of the Convention stipulates that the Conference of the Parties to the Minamata Convention shall adopt guidelines on the environmentally sound interim storage of mercury and mercury compounds, taking into account any relevant guidelines developed under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and other relevant guidance. These guidelines have been prepared on that basis.

3. These guidelines do not establish mandatory requirements or attempt to add to, or subtract from, a party's obligations under the Convention, in particular article 10. However, parties are required to take measures to ensure that the interim storage of mercury and mercury compounds is undertaken in an environmentally sound manner, and, in doing so, to take into account any guidelines adopted by the Conference of the Parties, as well as any requirements for interim storage that the Conference of the Parties may decide to adopt and annex to the Convention pursuant to article 27. This could include the use of national arrangements established prior to the adoption of these guidelines that, given a party's natural and social conditions, provide an equivalent or better system for the environmentally sound interim storage of mercury and mercury compounds, to which the individual clauses in these guidelines can be applied as long as they are practicable and consistent.

II. Scope of the guidelines

4. These guidelines provide guidance for the environmentally sound interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention. This guidance complements the requirements for the environmentally sound management of mercury waste. Under the Convention, certain uses of mercury and mercury compounds are not allowed after a certain date. (For example, the use of certain mercury-added products is not allowed after a phase-out date specified in annex A under article 4 of the Convention.) All uses of mercury and mercury compounds not specified in the Convention as being not allowed are considered to be allowed to a party under the Convention. Identifying priority actions within the context of these guidelines may also be appropriate, particularly if a party has determined that artisanal and small-scale gold mining (ASGM) and processing in its territory are more than insignificant. Parties that are developing or have developed an ASGM national action plan, for example, may want to consider prioritizing the sections of these guidelines that facilitate implementation of the actions specified in paragraph 1 of annex C of the Convention, in addition to taking into account the guidance on developing a national action plan to reduce and, where feasible, eliminate mercury use in ASGM adopted by the Conference of the Parties at its first meeting (UNEP, 2017a).

5. These guidelines do not consider options for final or permanent storage of mercury or for its stabilization or solidification. Those options are considered to relate to the environmentally sound management of mercury waste and are covered in the technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds developed under the Basel Convention (UNEP, 2015). It should be noted that, while those guidelines are publicly available, not all parties to the Minamata Convention are parties to the Basel Convention.

6. Article 10 of the Minamata Convention applies to the interim storage of mercury and mercury compounds as defined in article 3 of the Convention that do not fall within the definition of mercury wastes set out in article 11. Article 10 therefore covers (a) mercury (elemental); (b) mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight; and (c) mercury compounds, namely mercury(I) chloride (known also as calomel), mercury(II) oxide, mercury(II) sulphate, mercury(II) nitrate, cinnabar and mercury sulphide.

7. Additionally, as mercury and mercury compounds falling within the definition of mercury wastes under article 11 of the Convention are not covered by article 10, that article does not cover substances or objects (a) consisting of mercury or mercury compounds; (b) containing mercury or mercury compounds; or (c) contaminated with mercury or mercury compounds in a quantity above the

relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of or are intended to be disposed of, or are required to be disposed of by the provisions of national law or the Minamata Convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

8. The Convention stipulates that each party shall take measures to ensure that the interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention is undertaken in an environmentally sound manner, taking into account any guidelines and in accordance with any requirements adopted. The Convention does not include a definition of the term "interim". The English word "interim" is commonly understood to mean "in or for the intervening period; provisional or temporary" (definition appearing in the Oxford English Dictionary). In the case of the Minamata Convention, it would therefore apply to the period between the production or acquisition of the mercury or mercury compounds and their use as allowed to a party under the Convention. For information purposes, these guidelines include a section on the transport of mercury and mercury compounds.

9. The Basel Convention, in article 2, paragraph 8, defines the "environmentally sound management of hazardous wastes or other wastes" as "taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes".

10. On the basis of this definition, the environmentally sound storage of mercury and mercury compounds other than waste mercury can be considered to be storage in which the mercury or mercury compounds are managed in a manner that will protect human health and the environment against the adverse effects that may result from the storage of such mercury and mercury compounds.

11. While no strict definition of the maximum storage time is established for "interim storage", in line with the common use of the English word "interim" to mean "provisional" or "temporary", a party might wish to establish the maximum storage time to be considered "interim" storage at the national level.

12. A party to a legally binding instrument has consented to be bound by the obligations set out in that instrument. At the national level, the party may allocate responsibility for actions in relation to such obligations to entities operating within its territory. As the mercury and mercury compounds covered under article 10 are considered to be "commodity" substances (for a use allowed under the Convention as opposed to waste), it may be appropriate for responsibility for the environmentally sound interim storage of the mercury or mercury compounds to be delegated to the owner or custodian of the mercury or mercury compounds or to the entity that will gain commercial benefit from their use, under controls established by the party. A formal agreement between the owner of the mercury or mercury compounds and the manager of the storage facility may be required to formally delegate that responsibility. It should be noted that storage facilities may be owned privately or publicly, nationally or on a regional basis. Permission to operate an interim storage facility could be granted by the relevant national authority, and could specify quantitative limits for the amount of mercury or mercury compounds to be stored, along with relevant facility requirements. Entities that are not covered by permission arrangements should nevertheless be encouraged to follow these guidelines.

13. The Convention does not specify the amount of mercury or mercury compounds that may be stored prior to use. In certain jurisdictions, the same national controls may apply regardless of the quantity of mercury, while in others, different rules and standards may apply depending on the quantity stored. It is recognized that the guidelines may need to be applied flexibly in accordance with the requirements of specific sites. Article 3 of the Convention, on mercury supply sources and trade, specifies that each party shall endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks that exceed 10 metric tons per year, that are located within its territory. Guidance on the identification of such stocks and sources of supply is available in a separate guidance document adopted by the Conference of the Parties at its first meeting (UNEP, 2017b). Mercury and mercury compounds are expected to be stored in quantities commensurate with their intended use and the quantities considered necessary by the party to meet the requirements of domestic activities undertaken in accordance with the Convention, whether such activities consist of use in allowed mercury-added products, in processes using mercury or in ASGM.

14. In the case of ASGM, the quantities of mercury and mercury compounds stored should be commensurate with the baseline inventories and, where required, with reduction activities and targets specified in the national action plan provided for under article 7 of the Convention. The national action

plan may also address how the storage obligations under article 10 are to be met for ASGM-related activities and sites (taking into account these guidelines). The UNIDO technical guidelines for mercury management in ASGM (UNIDO, 2008) recommend that, when not used, elemental mercury (sometimes referred to as metallic mercury) be stored safely at all times in a secure location that is inaccessible to children, and in unbreakable air-tight containers with a protective coating to prevent mercury evaporation, and that mercury not be stored in a domestic residence. Countries developing their ASGM national action plans should refer to the guidance document on this topic (UNEP, 2017a). Where mercury is produced as a by-product (e.g., from mining processes), the quantity available may not be directly related to the quantities intended for use but may nevertheless be held in interim storage until it is determined whether it is to be used or disposed of.

15. Certain provisions of these guidelines may not be applicable for the interim storage of relatively small quantities of mercury or mercury compounds. Sections IV (A) and IV (B), for instance, are fully relevant for dedicated storage facilities but may not be fully applicable to small storage areas within large industrial plants. A party may apply the relevant parts of the guidance to such small storage areas at its discretion and as appropriate.

III. Overall management

16. To address the environmentally sound management of hazardous substances stored within their territory, parties may consider developing and implementing chemical management plans agreed on between the sectors involved, such as environment, labour and health. Such plans may include legislation, regulations, policies, agreements with industry, agreed standards, or any combination of these or other management mechanisms. Mercury and mercury compounds that are being stored pursuant to article 10 of the Convention should be included in any such management plan. To understand its needs for the interim storage of mercury and mercury compounds, a party may find it useful, during the development of its implementation activities, to identify the mercury and mercury compounds that are being held in its territory and to acquire a general understanding of the quantities of mercury and mercury compounds being stored in each location, in order to facilitate safe and appropriate storage. Such information can also contribute to the establishment of appropriate safety measures and regulatory inspection, as well as to the preparation of emergency response plans.

17. In relation specifically to mercury or mercury compounds, a national mercury inventory can provide useful information for all aspects of the implementation of the Minamata Convention. As is noted above, article 3 of the Convention requires parties to endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year that are located within their territories. Parties may find it useful to also identify smaller stocks or supplies of mercury or mercury compounds as part of their overall management of mercury and include these in their national inventory, should they have one. It is also recommended that the guidance in this document be applied to such smaller stocks or supplies to the extent possible when it is effective and practical. The identification of any uses of mercury within its territory will assist a party in estimating the quantities of mercury that require storage. It should be noted that, while the intended use of the stored mercury may not always be known, attempts should be made to ascertain and record the intended use of the stored mercury to ensure it is not directed to a use that is not allowed under the Convention. In addition to national methodologies, the United Nations Environment Programme toolkit for identification and quantification of mercury releases (UNEP, 2017c) provides parties with additional resources and information. While the toolkit is primarily designed for the assessment of mercury emissions and releases, it is also a source of information on the uses of mercury and mercury compounds that may be useful at the national level.

18. The guidance on the identification of stocks adopted by the Conference of the Parties at its first meeting (UNEP 2017b) can be used to establish an information registry on mercury at the national level, which could assist with safety and regulatory inspections, as well as with the preparation of emergency response plans consistent with national regulations and legislation. At a minimum, a registry of approved sites for the interim storage of mercury may be needed to ensure that storage is undertaken in an environmentally sound manner.

IV. Environmentally sound interim storage

A. Location

19. A number of environmental, technical and social factors should be considered when selecting the location of storage facilities. Thus, an environmental impact assessment, as well as social, legal and economic assessments, should be conducted to determine the best available site.

20. The site of the storage facility should be chosen on the basis of various criteria, including but not limited to geological, hydrological, hydrogeological, biological, ecological, meteorological and political criteria. A storage facility site should be located:

(a) In a permafrost-free area, or on thaw-stable permafrost to avoid the consequences of thawing on the facility infrastructures, especially in a warming climate;

(b) Away from geologically unstable areas such as seismically active areas, to prevent damage to the facility infrastructures, or in an area where the systems can withstand anticipated earthquake loadings;

(c) As far as possible from environmentally sensitive areas that have sensitive flora or fauna, including threatened or endangered species;

(d) Away from sensitive locations such as floodplains, water courses, aquifers and wetlands; and

(e) Insofar as practical, away from areas affected by armed conflict.

21. The above may not apply, however, if additional engineering measures are put in place to ensure that the storage facilities can withstand the site limitations and meet technical design and legal requirements.

22. In selecting a location for a new storage site, consideration should be given to any domestic requirements, including those pertaining to issues such as zoning (including locating storage facilities away from residences) or other restrictions on land use.

23. It is suggested that public consultations be held to inform the local community about siting criteria and procedures for mitigating potential human health and environmental risks associated with the storage of mercury or mercury compounds, including emergency response plans in the event of an incident. In certain jurisdictions, public consultation processes may be governed by specific laws or regulations.

24. In assessing storage sites for mercury and mercury compounds, national considerations may lead to the use of certain criteria as "exclusion criteria". For instance, the presence of certain elements might rule out the possibility of using a particular site. Other national criteria may be considered as positive or negative factors but not as decisive factors in excluding the site as an option. National consideration of circumstances, including a determination of acceptable risks, may be taken into account in assessing the importance of the various criteria. The weighting of particular criteria may also be related to the site's effect on storage stability. Careful consideration should therefore be given to site location, along with the other factors that affect site selection, such as the expected volume of mercury or mercury compounds to be stored or the available controls for safe management of the mercury or mercury compounds.

25. In considering storage sites for mercury and mercury compounds, consideration could be given to whether national storage sites are necessary or whether mercury and mercury compounds pending a use allowed under the Convention for a number of countries could be stored in a centralized storage facility. This would be most relevant where there are a number of facilities in the same geographical area but in different countries.

26. A storage facility could be located near a point of import in order to minimize the need for transportation. Site access should be adequate for receiving mercury and mercury compounds and releasing them for use. Consideration should be given to factors that could affect site or facility security. At private facilities where mercury or mercury compounds are used, consideration should be given to the actual location of the storage space for mercury and mercury compounds within the facility, including ease of access to the mercury or mercury compounds. Site security should also be considered.

B. Construction of interim storage facilities, including provision of barriers

27. A legislative and regulatory framework should be in place to ensure that facilities for the interim storage of mercury or mercury compounds fully protect the environment and human health. There should be legislation containing detailed requirements for the design, operation and closure of the interim storage facilities. Storage facilities should have certain containment characteristics to ensure the safe and environmentally sound interim storage of mercury and mercury compounds (QSC, 2003). The protection of soil, groundwater and surface water should be carefully considered, particularly in the construction of facilities for the storage of large quantities of mercury or mercury compounds. Such protection could be achieved through a combination of a geological barrier and other impermeable barriers. A European Union directive, for instance, calls for storage sites to have engineered or natural barriers adequate for protecting the environment against mercury releases and a containment volume adequate for the total quantity of mercury stored (EU, 2011). Storage site development should be guided by the nature of the site, geology and other project-specific factors, as well as appropriate geotechnical engineering principles. Such factors may be less important for sites designed for the storage of small quantities of mercury or mercury compounds.

28. In building a new facility or retrofitting an existing one, consideration should be given to its size, layout and design, floor strength requirements, surface coatings, plumbing and drains, air flow and ventilation, and the acceptable temperature range for storing elemental mercury. The facility's size will depend on the amount of space needed for present and future storage and on the method of storage.

29. Facilities should be designed to facilitate the safe handling of containers and might include separate, self-contained areas for container shipping and receiving and for repackaging operations, as these are the operations most vulnerable to accidents and spillage of mercury and mercury compounds. In large, dedicated mercury storage facilities, the aisles in storage areas should be wide enough to allow for the passage of inspection teams and emergency equipment. Consideration should be given to the safety of loading activities. Handling areas inside the facility, where mercury or mercury compounds may be transferred between containers, should have negative pressure environments to avoid mercury emissions outside the building. Where indoor air is vented outside, parties should consider whether the levels of mercury and mercury compounds in the handling and storage areas call for venting via activated carbon or other mercury capture systems.

30. The storage site should be equipped with a fire protection system (EU, 2011). Emergency response plans should be developed in coordination with the local fire department to ensure that it is sufficiently informed, trained, equipped and otherwise prepared to safely handle any fires at the facility. To reduce the risk of fires, facilities should be constructed of non-combustible materials and non-combustible materials should be used for pallets, storage racks and other interior furnishings. To further minimize the risk of fire, it is suggested that battery-powered electric forklifts be used to transport the mercury or mercury compounds inside the storage facility (QSC, 2003).

31. A drainage and collection system for water discharged from storage sites could be installed within the sites to enable mercury monitoring and ensure that mercury and mercury compounds are not discharged to water systems.

32. Storage facility floors should be designed to withstand the load calculated using the actual conditions of the facility. A simplified method would be to design the floors to withstand 50 per cent more than the total load from the mercury or mercury compounds being stored. Storage facility floors should not be penetrated by any drains or plumbing. Sloped floors and open-flow gutters with rounded-down edges should be used to avoid trapping mercury or mercury compounds under gutter covers and to facilitate the collection of spills. The floors of storage facilities should be covered with mercury-resistant materials such as an epoxy coating. It may be preferable for the floors to be light-coloured to allow the detection of mercury droplets. Floors and their coatings should be inspected frequently to ensure that the floors have no cracks and the coatings are intact. Walls should be built of materials that do not readily absorb mercury vapour; porous materials such as wood should be avoided. It is important to prevent releases and minimize environmental and health impact by providing redundant systems such as secondary containment capable of handling an unexpected event, monitoring for releases, and measures to protect the workforce and the public from exposure. (US DOE, 2009; Euro Chlor, 2007). Additional relevant information is available on the website of the World Chlorine Council (see the list of references at the end of the present guidelines). The temperature in handling areas with greater potential for higher vapour levels and corresponding risks should remain as low as possible (UNEP, 2015). Storage areas should be clearly marked with warning signs (FAO, 1985; US DOE, 2009).

33. Mercury and mercury compounds should be stored indoors whenever possible. When they are stored in enclosed outdoor facilities, particular care should be taken to implement protective measures to prevent releases of mercury and mercury compounds into soil, groundwater and surface water. Stored mercury and mercury compounds should be protected from external factors to prevent damage to containers and the integrity of stored containers should be checked regularly.

34. Storage facilities should be secured to avoid theft and unauthorized access. Moreover, depending on the scale of the facility, monitoring procedures should be established for the operation and decommissioning phases of the storage sites so that potential adverse environmental effects of the storage sites can be identified rapidly and appropriate corrective measures taken.

C. Containers for the storage of mercury, including secondary containers

35. **Segregation:** The type of storage container used will depend on whether the material to be stored is elemental mercury or a mercury compound. Elemental mercury is a liquid at room temperature, while most mercury compounds are solids. Solids and liquids require different types of storage containers. Any risk of contamination of other materials should be avoided. Containers and packages holding mercury or mercury compounds should not be placed together with containers holding other substances. Separate storage areas, even within the same storage facility, should be established. Containers and packages should be marked and stored in a dry, secure place such as a warehouse or other space that is not usually frequented by people.

36. **Ventilation:** Areas used to store mercury or mercury compounds should not share ventilation systems with work or public areas. They should have their own ventilation systems or be vented directly to the outdoors. Ideally, ventilation systems for handling area should be filtered or include pollution control devices to capture any mercury vapour or dust release. Guidance developed by the United Nations Development Programme (UNDP, 2010) for mercury wastes generated by healthcare facilities provides detailed advice that can be used by many types of commercial facilities.

37. **Containers:** Elemental mercury in bulk form should be carefully packaged in appropriate containers, such as those identified in the *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations* (United Nations, 2017). Solid mercury compounds should be stored in sealed containers such as barrels or pails with well-fitting lids or in specially constructed containers that do not release mercury vapour.

38. Containers should meet the following criteria:

(a) They should not be damaged by any materials previously stored in them or have contained materials that could adversely react with mercury.

(b) Their structural integrity should be intact.

(c) They should not be excessively corroded.

(d) They should have a protective coating (paint) to prevent corrosion.

(e) They should be gas- and liquid-tight.

39. Appropriate materials for mercury containers include carbon (minimum ASTM A36) and stainless steel (AISI 304 or 316L) (EU, 2010), which do not react with mercury at ambient temperatures. No protective coating is needed for the inner surface of such containers as long as the mercury to be stored in them meets the purity standards for storage as elemental mercury and no water is present inside the container. Protective coatings (such as epoxy paint or electroplating) should be applied to all exterior carbon steel surfaces in a manner that does not leave any steel exposed. Coatings should be applied in a manner that minimizes paint blistering, peeling and cracking. Some plastics, such as high-density polyethylene, are permeable to mercury vapours and should be avoided. Seamless flasks and containers are recommended to eliminate the risk of breaches along the seams (QSC, 2003).

40. There are two main types of internationally approved mercury storage and transport containers: 34.5 kg flasks and one-metric-ton containers (QSC, 2003). The design type of the container should pass the drop test and the leakproofness tests as described in chapters 6.1.5.3 and 6.1.5.4 of the *United Nations Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria* (EU, 2011). For transporting smaller quantities of mercury, other sizes (e.g., 1–16 lbs) and types (e.g., polyethylene, glass) of containers are often used (QSC, 2003); however, the level of protection such containers provide should be taken into account.

41. When storing mercury in containers, it is important to leave some "head space" to allow for thermal expansion of the mercury. In European Union guidance, the maximum filling ratio of a

container is 80 per cent by volume, and the head space is therefore at least 20 per cent (EU, 2011). Other jurisdictions specify a maximum filling ratio of 85 per cent, for a 15 per cent head space.

42. When mercury is stored, it should be as pure as possible in order to avoid chemical reactions and the degradation of containers. A mercury content greater than 99.9 weight per cent is recommended. For lower purity levels (95–99.9 weight per cent), it may be necessary to monitor the condition of the containers to detect any degradation over time.

43. Containers for elemental mercury should be stored upright on pallets off the ground, with no mercury or mercury compounds on the exterior surface. Alternatively, the packages could be placed in protective outer packaging such as a box or crate. The use of wood or other porous materials for pallets should be avoided as such materials are difficult to decontaminate after use. Elemental mercury in containers should be placed in containment trays or in a leak-proof area of the storage facility that ideally has curved edges to limit the potential accumulation of elemental mercury in any corners, and where spills can be contained. The liquid containment volume should be at least 125 per cent of the maximum liquid volume, taking into account the space taken up by items stored in the containment area.

44. **Labelling:** Labels including information on the names of the suppliers of the mercury, the origin of the mercury (if known), the level and purity of the mercury, the container number, the gross and net weight and the date when the container was filled with mercury should be affixed to each container, along with an appropriate corrosive label (US DOE, 2009). Care should be taken to use labels that are in line with the globally harmonized system of classification and labelling of chemicals (United Nations, 2015). In addition, among other things, the information that the container meets appropriate national and international technical standards regarding tightness, pressure stability, shock resistance and behaviour when exposed to heat should be available for mercury handlers.

D. Movement of mercury and mercury compounds

45. An inventory of the mercury and mercury compounds kept at a storage site should be created and updated as mercury and mercury compounds are added to the facility, used, removed from the facility or disposed of in accordance with article 11 of the Minamata Convention. The inventory sheet should be checked periodically against the containers stored at the facility to ensure its ongoing accuracy. Shipments of mercury and mercury compounds should be recorded, with consideration given to the requirements of article 3 of the Convention that pertain to the import and export of mercury from the country. The maintenance of tracking records is useful for auditing of facilities and for reporting under article 3 in relation to stocks of mercury or mercury compounds greater than 50 metric tons. Periodic reporting of the relevant information on mercury and mercury compounds stored or used may also be considered to obtain the data needed for reporting under article 3. Guidance on the determination of such stocks is available on the Minamata Convention website (UNEP 2017b).

46. Regular inspection and audits of storage areas should be undertaken, focusing especially on damage, spills and deterioration. Clean-up and decontamination should be carried out speedily, but not without alerting the authorities concerned (FAO, 1985).

47. All documents containing the required information, including the certificate accompanying the container and records concerning the destocking and dispatch of the mercury after its temporary storage, its destination and its intended use, should be kept for a nationally defined period after the termination of the storage. A number of parties consider at least three years to be appropriate.

E. Education and training of staff

48. Personnel engaged in the handling or storage of mercury or mercury compounds should have adequate appropriate training. Personnel who do not handle the mercury or mercury compounds in the storage area but could be exposed by an accidental release should also understand the risks and hazards of mercury and mercury compounds and be familiar with the facility's emergency response plans (QSC, 2003). Access to the storage area should be restricted to those with adequate training, including in the recognition of mercury-specific hazards and the handling of mercury and mercury compounds.

49. Employee training in environmentally sound management and workplace health and safety should be provided to ensure that employees are protected against mercury releases within the facility, exposure and accidental injury.

50. Employees should have basic knowledge of the following:

(a) The chemical properties and adverse effects of mercury;

(b) How to identify mercury and segregate it from other hazardous substances;

(c) Occupational safety standards relevant to mercury and mercury compounds;

(d) How to use personal protective equipment provided by the employer, such as body coverings, eye and face protectors, gloves and respiratory protectors, including how to properly handle and dispose of such equipment;

(e) Labelling and storage standards considered appropriate for the facility or facilities, container compatibility and dating requirements and closed-container requirements;

(f) How to safely handle mercury and mercury compounds using the equipment available at the facility;

(g) How to use engineering controls to minimize exposure;

(h) How to deal with accidental spills of mercury or a mercury compound; and

(i) How to use mercury vapour monitoring devices to identify possible sources of elevated mercury levels in the facility and provide workers with the information they require to ensure safety (e.g., when respiratory protection may be warranted).

51. It is important to have worker insurance and employer liability insurance as required under national law.

52. Materials useful for training employees include mercury awareness-raising packages such as the one developed by UNEP (2008) and UNEP publications available on the Minamata Convention website (http://mercuryconvention.org/Resources/Information/Publications/tabid/3429/language/en-US/Default.aspx). All training materials should be translated into local languages and made accessible to employees.

F. Timetables for repair, testing and maintenance

53. Regular inspections should be undertaken to ensure that the facility, including all equipment, is in good condition. Such inspections should include examination of the containers, spill collection areas, floors and walls to ensure that there are no mercury releases and that the equipment and any coatings are intact. The site security should be inspected. The inspection schedule may be determined by national regulations or instructions or by the facility manager. A clear plan for a regular monitoring and repair schedule should be in place before the facility starts operating. Routine maintenance evaluations should be undertaken and detailed records of inspections and maintenance should be kept.

54. Indoor air monitoring should be considered to check for leaks and protect workers on site. Such monitoring could be required under national or local legislation. A continuous indoor air monitoring system could be used to detect leaks as early as possible, with sensors positioned at ground and head levels and visual and acoustic alarm systems. A number of continuous mercury measurement systems are commercially available for some types of mercury monitoring. Alternatively, suitable monitoring may be undertaken through site sampling in the environment. When leaks are detected, the operator should immediately take all necessary actions to avoid any releases of mercury (EU, 2011).

55. The information obtained from monitoring can be used to determine whether the stored mercury and mercury compounds are being properly managed, to identify potential issues relating to possible releases or emission of or exposure to mercury and to help assess whether amendments to the management approach might be appropriate. A monitoring programme will help facility managers to identify problems and take appropriate measures to remedy them. All equipment, including monitoring equipment, should be subject to routine maintenance, including testing to ensure that it is properly calibrated and functioning correctly. Monitoring should also be carried out in peripheral areas to detect any potential impacts. If the results show exceedances of specific limits, action should be taken and/or remedial measures applied. A contingency plan should be in place.

56. All performance monitoring should be reported to the relevant government authorities. Governments may request the results of inspections, monitoring and remedial measures to be reported. Moreover, an annual report should be produced containing the results of the monitoring programme, an assessment of those results, any corrective actions and the relative success of the corrective actions. Data should be retained for an agreed period of time.

G. Emergency measures, including personal protective equipment

57. Site-specific plans and procedures should be developed for implementing the specific requirements identified for the storage of mercury and mercury compounds, in line with national standards and with the approval of the relevant safety and environmental management authorities. A

workable emergency plan should address public evacuation and procedures to be followed in the event of terrorism, fire or other disastrous events that could result in significant mercury releases both inside and outside the facility's perimeter. The plan should be in place and should be implemented immediately in case of accidental spillage or other emergencies (QSC, 2003). Nearby communities should be aware of the emergency plan and know how to follow its procedures. A person should be designated with the responsibility to authorize any changes to safety procedures that might be needed to facilitate the work of emergency response personnel in emergencies. Adequate access to the affected area should be ensured.

58. Emergency response plans or procedures should comply with local, regional and national requirements and include procedures for first responders, including fire department staff, emergency response personnel, ambulance personnel and local hospitals (QSC, 2003). While such plans can vary according to the physical and social conditions of each site, the principal elements of an emergency response plan include the identification of potential hazards; legislation governing emergency response plans; action to be taken in emergency situations, including mitigation measures; personnel training plans; communication targets (fire service, police, neighbouring communities, local government, etc.) and methods in case of emergency; and methods and schedules for the testing of emergency response equipment. Emergency response practice exercises should be conducted.

59. Emergency response plans or procedures should cover a number of different scenarios, which could include but should not be limited to:

(a) Damage to storage containers during handling, including distinctions between minor damage and catastrophic damage (e.g., complete failure of the seal on a container);

(b) Discovery of container leakage during routine inspections;

(c) Release occurring during repackaging operations; and

(d) Damage to the storage facility itself (e.g., owing to flood, fire, severe adverse weather, a serious accident or vandalism that compromises the physical integrity of the facility).

60. For each scenario, response guidance should identify:

(a) The equipment and procedures needed to address the release and the type of mercury or mercury compound;

(b) The first aid attendant and/or official first responder that will handle medical emergencies;

(c) The site official responsible for overseeing the assessment of the situation (i.e. whether it is a minor or major release) and supervising workers in addressing the release or accident;

(d) Procedures for notifying the other workers at the facility (particularly regarding the need to don personal protective equipment);

(e) When to contact local emergency response personnel for additional support;

(f) When to contact national environmental hotlines if they exist;

(g) When to notify the public and what action the public should take;

(h) When it is appropriate to evacuate non-essential workers from the facility; and

(i) When it may become necessary to evacuate all workers from the facility.

61. All equipment needed to address spills or releases of mercury or mercury compounds should be available on site and in good working order. The type of equipment required may depend on the scale of the facility. Such equipment may include sorbent materials, chemical reagent products that can be applied to elemental mercury spills to reduce mobility, shovels and other tools for picking up spilled materials and extra drums or other containers in which to place cleaned-up materials. Specialized vacuum cleaners (with carbon filters in their exhausts) may be used. Facilities should also have the capacity to appropriately contain and manage any contaminated wash water that may be generated.

62. When an emergency occurs, the first step is to investigate the site to ensure that all those who were near the spill are safe and have received any needed medical treatment. The second step is to notify the authorities and keep the site secured until the appropriate official has deemed the area safe for investigation. The person in charge should wear suitable personal protective equipment and approach cautiously from upwind, secure the scene and identify the hazard. Placards, container labels, shipping documents, safety data sheets, car identification charts and knowledgeable people on the

scene are valuable sources of information. The need to evacuate, the availability of human resources and equipment and possible immediate actions should then be assessed. In order to ensure public safety, a call to an emergency response agency should be made and, as an immediate precautionary measure, the spill or leak area should be isolated by at least 50 metres in all directions.

63. In case of fire, workers should first put on personal protective equipment. An extinguishing agent suitable for the type of surrounding fire should be used. Equipping the storage facility with a dry-pipe (water supply) fire suppression system and emergency response equipment is recommended. For further information, the *Emergency Response Guidebook* (US DOT and others, 2016) is a helpful resource. If the fire is confined to a given space, the mercury and mercury compound storage containers should be moved away from the fire, using utmost precaution. After the fire is extinguished, the mercury and mercury compound storage containers may need to be treated with a water spray until they are sufficiently cooled (QSC, 2003).

64. Any spillage of mercury or mercury compounds, even in small amounts, should be considered hazardous and cleaned up with caution. Spills should be reported to management and the date, time, inspector, location and approximate amount of mercury or mercury compounds should be documented and the records of such incidences maintained (QSC, 2003). Evaluating the type of mercury or mercury compound spilled, the spill's size and dispersal, proximity of the spill to residents and environmentally sensitive areas and whether the necessary clean-up resources and expertise are available is critical to determining the appropriate type of response for a mercury or mercury compound spill. If the spill is small and on a non-porous surface (such as linoleum), it can be cleaned up by facility personnel or workers and disposed of in an environmentally sound manner. If the spill is large or in cracks or crevices, it may be necessary to hire someone with suitable professional training should such personnel not be available at the facility. Large spills involving more than the amount of mercury or mercury compounds found in a typical household product should be reported to the relevant authorities. If there is any uncertainty as to whether a spill should be classified as "large", the relevant authorities should be contacted. Under certain circumstances outlined in the emergency plan, it may be advisable to obtain the assistance of qualified professional clean-up or air monitoring personnel regardless of spill size.

65. Guidance on clean-up of household spills is available on the websites of Environment and Climate Change Canada and the United States Environmental Protection Agency (US EPA) (see the list of references at the end of the present guidelines) and may be adapted for use in other situations. Spills of elemental mercury during commercial activities and in households have the potential to expose workers and the general public to hazardous mercury vapours. In addition, they are disruptive and costly to clean up. Clean-up procedures for small mercury and mercury compound spills are posted on the US EPA website.

V. General guidance on health and safety

66. The development and implementation of public health and safety activities and worker health and safety activities to prevent and minimize exposure to mercury and mercury compounds are key aspects of the environmentally sound storage of mercury and mercury compounds.

A. Public health and safety

67. Ensuring public safety is dependent on appropriate reporting of both routine and accidental mercury releases by facility operators. The timely reporting of such information to local authorities requires that both routine and emergency procedures for reporting releases, including to civil authorities and local emergency responders, be clearly established before a facility begins operation. People living and working near storage facilities may also be exposed to environmental, health and accident risks relating mainly to emissions and releases from work undertaken at the facility, as well as from transport to and from the facility. Adequate measures are necessary to prevent and minimize the impacts of such emissions and releases on human health and the environment. Monitoring programmes can help in identifying problems and taking appropriate measures to remedy them. Such programmes could include monitoring for any emissions or releases of mercury or mercury compounds outside the facility to determine there is any exposure of the local population. Facility operators may wish to host community awareness forums to address questions concerning facility siting, operations and emergency response plans.

B. Worker health and safety

68. Employers should ensure the health and safety of all employees while they are at work. An exposure assessment can be undertaken for all employees who are directly exposed to mercury or mercury compounds and appropriate monitoring and industrial hygiene practices adopted.

Colorimetric badges and/or personal monitoring equipment (vapour sampling devices) are needed for this kind of comprehensive exposure assessment and monitoring programme. Pre-employment physical examinations are carried out to establish a baseline for determining an individual's background mercury level and help to ensure that the employee has normal body chemistry for mercury removal. Personnel may have other considerations that should be handled on a case-specific basis. Medical monitoring programmes should also include periodic physical exams (e.g. every one to three years), regular blood tests and regular urinalysis. Consideration should be given to offering alternative job opportunities to workers who become pregnant or who are breastfeeding.

69. Every employer should obtain and maintain insurance, under an approved policy from an authorized insurer, providing a sufficient level of coverage in case of liability (including those that may require compensation) for bodily illness or injury sustained by employees arising from and during the course of their employment, in accordance with national law. Facility-specific health and safety plans should be in place at all facilities handling mercury or mercury compounds to ensure the protection of everyone in and around such facilities. Such plans should be developed by trained health and safety professionals with experience in managing health risks associated with mercury and mercury compounds.

70. The protection of workers who handle mercury or mercury compounds and of the general public can be achieved by the following means:

(a) Restricting facility access to authorized personnel;

(b) Ensuring that occupational exposure limits for hazardous substances are not exceeded by making sure that all personnel use appropriate protective equipment;

(c) Ensuring appropriate ventilation of facilities to minimize the risk of exposure to volatile substances or substances that can become airborne; and

(d) Ensuring that facilities comply with all national and regional laws on workplace health and safety.

71. Guideline values for mercury concentrations in drinking water and ambient air established by the World Health Organization (WHO) are 6 µg/L for inorganic mercury and 1 µg/m^3 for inorganic mercury vapour (WHO, 2008; WHO Regional Office for Europe, 2000). Governments are encouraged to monitor air and water, especially near sites where activities using mercury and mercury compounds take place. Some countries have established permissible levels of mercury in the working environment (e.g. 0.025 mg Hg/m^3 for inorganic mercury, excluding mercury sulphide, and 0.01 mg Hg/m^3 for alkylmercury compounds in Japan). Management operations should be conducted so as to satisfy any applicable requirements regarding permissible levels of mercury in the working environment, and facilities where such operations are conducted should be designed and operated in such a way as to minimize mercury releases to the environment insofar as technically possible.

VI. Risk communication

72. Governments, business people, consumers, experts, NGOs and other stakeholders need to work together to promote the smooth and efficient reduction of environmental risks. Understanding both the risks and each other's perspectives is essential, and risk communication is therefore important. Risk communication on the interim storage of mercury and mercury compounds includes, for instance, sharing information about and conveying stakeholders' understanding of risks relevant to siting, operation and decommissioning of storage facilities and transport of mercury and mercury compounds to promote rational actions. To support risk communication, it is important to deepen stakeholder understanding of the concept of risk, which is expressed as a probability, to provide information in a timely manner at each stage of risk assessment and to have an interactive communication system.

VII. Closure of a facility

73. A closure plan should be prepared during the design phase for the interim storage facility. This plan should be updated regularly to reflect any changes in site conditions from the design phase to the closure phase. At the end of a facility's life, all mercury, mercury compounds and mercury-contaminated materials should be removed during closure. Air, equipment and soil measurements may be taken to confirm that site closure has been undertaken in an environmentally sound manner. If contamination is present, the site should be treated as a contaminated site.

VIII. Information regarding transport of mercury and mercury compounds

74. The latest versions of the following documents should be consulted to determine specific requirements for the transport and the transboundary movement of mercury and mercury compounds:

(a) *International Maritime Dangerous Goods Code* (International Maritime Organization);

(b) *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (International Civil Aviation Organization);

(c) *Dangerous Goods Regulations* (International Air Transport Association, 2016); and

(d) *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations* (United Nations, 2017).

75. Mercury and mercury compounds should be transported in a safe and environmentally sound manner in order to avoid accidental spills; they should also be tracked during transport until they have reached their final destination. Prior to transport, contingency plans should be prepared to minimize environmental impacts associated with vehicle accidents, spills, fires and other potential emergencies. During transport, mercury and mercury compounds should be identified, packaged and transported in accordance with the relevant national regulations on the transport of dangerous goods, which are generally based on the model regulations in the United Nations recommendations on the transport of dangerous goods (United Nations, 2017). Detailed transport requirements are not included in the present guidance at this stage, as it is considered more appropriate for the relevant primary source to be consulted for such information.

76. Companies transporting mercury or mercury compounds within their own countries should hold authorization to transport dangerous goods and their personnel should have the necessary qualifications and certification to handle dangerous goods in accordance with applicable national and local rules and regulations. Transporters should manage mercury and mercury compounds in a way that prevents container breakage, environmental releases and exposure to moisture. National transportation legislation for hazardous substances or dangerous goods often controls packaging and labelling for transport at the national level. If no guidance is available at the national level, the resource materials for transboundary transport of dangerous goods (listed in para. 74 above) can be consulted. The Globally Harmonized System of Classification and Labelling of Chemicals (United Nations, 2015) should also be taken into account as appropriate. The shipping papers should include an emergency response telephone number and a certification that the shipment is in compliance with all regulations. In addition, the shipper should mark the containers with the appropriate signs, including the specified label, the proper shipping name and the UN number. For mercury, the specified label is "Corrosive", the proper shipping name is "Mercury" and the UN number is "UN 2809" (QSC, 2003).

77. The mercury shipment should be accompanied by a chemical analysis report that demonstrates the mercury's level of purity and identifies any contaminants.

78. Upon arrival, the transport vehicle should be visually inspected for any obvious leaks, spills, droplets or other pools of free elemental mercury and all suspected mercury sources should be documented and reported to management. The shipment is accepted as compliant or rejected as non-compliant on the basis of the inspection; a written report including all the relevant information should be kept by the facility (QSC, 2003). When rejecting the shipment, the facility operator should ensure that the required actions under the contingency plan have been taken without causing further spread of leakage outside of the facility.

79. To ensure that releases from the handling and transport of mercury or mercury compounds are kept to a minimum, it is important to raise the awareness of those involved (e.g., transporters, recyclers and treatment operators) about the risks of mercury. Such awareness-raising can be achieved through training activities such as seminars providing information on new systems and regulations and opportunities for information exchange, preparation and distribution of leaflets and dissemination of information via the Internet.

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UNITED NATIONS

MC

UNEP/MC/COP.2/6

Distr.: General
31 August 2018

Original: English

United Nations Environment Programme

Conference of the Parties to the Minamata Convention on Mercury
Second meeting
Geneva, 19–23 November 2018
Item 5 (c) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: mercury waste, in particular consideration of relevant thresholds

Report on the outcome of the open-ended process on waste thresholds called for under article 11

Note by the secretariat

1. In decision MC-1/19, on mercury waste, the Conference of the Parties to the Minamata Convention on Mercury established an open-ended process on waste thresholds called for under article 11, and requested the secretariat to:

(a) Circulate an open call to all parties, non-parties and other relevant stakeholders for the nomination of experts to participate in the process, including a request for a brief description of their relevant expertise;

(b) Call for submissions by the experts related to the types of waste that fall within the categories specified in paragraph 2 of article 11;

(c) Prepare an organized compilation of the information received;

(d) Circulate the compilation to experts, with a request for input on prioritizing the types of waste that are most relevant to the establishment of waste thresholds, mindful of the objective of the Convention, including the basis for such prioritization;

(e) Consolidate the input received from the experts, and provide the consolidation to the experts, with a request for the submission of possible approaches to establishing any needed thresholds for the waste prioritized above;

(f) Report to the Conference of the Parties at its second meeting on the outcomes to date of the open-ended process.

2. The report on the outcome of the process, including a consolidation of the submissions from nominated experts, is set out in the annex to the present note.

3. Regarding the types of waste that fall within the categories specified in paragraph 2 of article 11, a draft table of examples of waste consisting of, containing, or contaminated with mercury or mercury compounds was developed (see annex to the present note). The draft table includes reference to issues to be discussed on the inclusion or description of certain types of waste.

* UNEP/MC/COP.2/1.

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4. Regarding the prioritization of the types of waste that are most relevant to the establishment of waste thresholds, a consensus has emerged that waste contaminated with mercury was of a high priority. Differing views were expressed as to the priorities in terms of the other types of waste. Experts also noted that thresholds regarding overburden, waste rock and tailings from mining needed separate consideration, with differing views on the prioritization of that work.

5. Regarding the identification of possible approaches to establishing thresholds, experts identified three different approaches in describing the thresholds, namely, total concentration of mercury in the waste, measures of the release potential of mercury in the waste, and a qualitative determination (i.e., a listing approach). Different views were expressed on which approach should be taken.

6. Experts acknowledged the need for further discussion on the approaches to establishing thresholds, as well as further collection of information, including on the mercury content of waste, national regulations and guidelines, and methods for sampling and analysis. Experts suggested that face-to-face meetings or conference calls might be needed for further discussion.

7. Information submitted by the nominated experts that may contribute to the development of mercury waste thresholds is compiled in UNEP/MC/COP.1/INF/10.

Suggested action by the Conference of the Parties

8. The Conference of the Parties may wish to review the progress achieved during the open-ended process by considering the outcome of the process, set out in the annex to the present note, and decide on further action, taking into account the most effective modalities for determining relevant thresholds, including the further work needed to establish mercury waste thresholds, as identified by the experts and described in paragraphs 44 and 45 of the annex.

Annex

Consolidation of submissions from experts nominated to the open-ended process to initiate work on the relevant thresholds called for under article 11

A. Overview

1. The present report presents an organized compilation of submissions received from nominated experts on mercury waste thresholds. Comments were invited in three rounds as follows:

(a) In the first round, 12 experts commented on the types of waste that fall within the categories specified in paragraph 2 of article 11.

(b) In the second round, 20 experts commented on the prioritization of waste for the establishment of mercury waste thresholds.

(c) In the third round, 14 experts commented on possible approaches to establishing any needed thresholds for the waste prioritized as described in paragraph 1 (b) above.

2. A number of experts provided information that may contribute to the development of thresholds, such as existing national guidelines and data related to mercury content of waste. That information has been compiled in document UNEP/MC/COP.2/INF/10.

B. Types of mercury waste

1. Definition of mercury waste

3. Article 11 of the Minamata Convention on Mercury defines mercury wastes as substances or objects:

(a) Consisting of mercury or mercury compounds;

(b) Containing mercury or mercury compounds; or

(c) Contaminated with mercury or mercury compounds.

4. A number of experts stressed the need for further clarification of these terms. One expert, referring to discussions in the intergovernmental negotiating committee, proposed the following definitions for further discussion:

(a) Consisting of mercury or mercury compounds: the significant compound of the waste is mercury or a mercury compound. ("significant" could be defined by a range of concentration, e.g., 0.1–100 per cent);

(b) Containing mercury or mercury compounds: mercury or mercury compounds were added intentionally to the original material which is a waste now;

(c) Contaminated with mercury or mercury compounds: mercury or mercury compounds were not added intentionally to the original material which is a waste now.

5. Another expert preferred to include some flexibility so that all mercury waste could be identified in a practical way, and without dedicating resources to assigning a waste that was clearly subject to paragraph 2 of article 11 to a particular category. According to this expert:

(a) Waste consisting of mercury or mercury compounds is regarded as relatively pure mercury, or technical grade commercial mercury chemicals, or otherwise high-mercury concentration wastes;

(b) Waste containing mercury or mercury compounds is generally considered to identify discarded or spent mercury-added devices or products;

(c) Waste contaminated with mercury or mercury compounds would be an "all other" category, and consist of most industrial waste and wastewater from processes that use mercury or mercury compounds in some way.

6. Yet another expert observed that examples of waste contaminated with mercury were needed for clarification purposes, requiring the development of an indicative, non-exhaustive list.

2. Examples of mercury waste

7. Paragraph 3 (a) of article 11 of the Minamata Convention requires parties to take appropriate measures so that mercury waste is managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. The technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds under the Basel Convention (UNEP/CHW.12/5/Add.8/Rev.1) cover the following categories of mercury waste:

A: Wastes consisting of mercury or mercury compounds (e.g., excess mercury from the decommissioning of chlor-alkali facilities, mercury recovered from wastes containing mercury or mercury compounds or wastes contaminated with mercury or mercury compounds or surplus stock of mercury or mercury compounds designated as waste);

B: Wastes containing mercury or mercury compounds;

B1: Wastes of mercury-added products[1] that easily release mercury into the environment, including when they are broken (e.g., mercury thermometers, fluorescent lamps);

B2: Wastes of mercury-added products other than those listed in B1 (e.g., batteries);

B3: Wastes containing mercury or mercury compounds that result from the treatment of mercury wastes listed as A, B1, B2 or C;

C: Wastes contaminated with mercury or mercury compounds (e.g., residues[2] generated from mining processes, industrial processes or waste treatment processes).

8. One expert noted that the category B3 in the previous paragraph was confusing since residuals from wastewater treatment or production process were categorized as C, and treatment residuals should be consistently categorized regardless of their sources. A number of other experts also raised questions on category B3.

9. The technical guidelines under the Basel Convention include a table listing examples of types of mercury waste, which has been used as a basis for the table below. The comments of experts on the types of waste have been incorporated into the table, with additional examples underlined. One expert observed that the table needed more discussion and refinement, although that work should be deferred until there was consensus on the broader questions raised by the threshold-setting exercise.

10. One expert proposed the inclusion of waste arising from waste management operations, such as mercury sulphides from the stabilization of waste, and mercury or slags from (pre-)treatment of waste contaminated with mercury, noting that different steps of waste treatment sometimes happened in different facilities. How those wastes should be listed may need further discussion.

11. One expert objected to categorizing mining waste as waste contaminated with mercury, since those were materials in which mercury was naturally occurring, and to construe those materials as "contaminated" was inaccurate. According to that expert, an accepted definition of "contamination" by the Society of Environmental Toxicology and Chemistry was a "condition in which substances are present where they would not normally be found or where they occur above natural background levels."

[1] "Mercury-added product" means a product or product component that contains mercury or a mercury compound that was intentionally added (see art. 2 (f) of the Minamata Convention).

[2] One expert commented that the word "residue" should be clarified.

List of types mercury waste

A: Wastes consisting of mercury or mercury compounds

Source	*Examples of waste types*	*Remarks*	*Comments from experts*
Primary (virgin) metal production			
Gold amalgamation	Mercury used for amalgamation, recovered mercury		One expert proposed the deletion of this entry from the list, since gold amalgamation was only practiced in ASGM, which was covered by article 7. A number of experts disagreed with the proposal, noting that waste from ASGM was not exempted from article 11.
Metal (copper, lead, zinc) extraction and initial processing	Calomel recovered from zinc, lead and copper smelting process		One expert commented that to the extent that calomel was being sold into commerce and therefore addressed by article 3, it should not be considered as mercury waste. Another expert disagreed, mentioning an example where calomel was shipped for landfill. One expert wondered where by-product mercury (e.g., from precipitation and distillation in the Merrill Crowe process) should be listed. It could probably be listed here.
Intentional use of mercury in industrial production			
Chlor-alkali production with mercury technology	Waste electrodes, recovered mercury	• Mercury cell • Mercury recovery units (retort)	
Production of alcoholates (e.g., sodium or potassium methylate or ethylate), dithionite and ultrapure potassium hydroxide solution	Waste electrodes, recovered mercury	• Mercury cell • Mercury recovery units (retort)	One expert proposed the deletion of "recovered mercury" from the examples, except for chlor-alkali, since the recovered mercury had an allowable use and was therefore a commodity, not a waste. A note may be added to recovered mercury that has allowable use under the Convention. It should be noted that mercury from the decommissioning of mercury is listed under secondary metal production – recovery of mercury.
VCM production with mercuric chloride ($HgCl_2$) catalyst	Waste catalyst, recovered mercury	• Mercury catalyst process	Waste catalyst is also listed in category C. One expert commented that waste

Source	*Examples of waste types*	*Remarks*	*Comments from experts*
			catalyst from VCM production should be listed under category C and deleted from category A. According to that expert, VCM manufacturers did not recover mercury from catalyst but the recovery was done in a separate plant. It could therefore be mentioned under "secondary metal production – recovery of mercury".
Acetaldehyde production with mercury sulphate ($HgSO_4$) catalyst	Waste catalyst, recovered mercury	• Mercury catalyst process	
Polyurethane production using mercury-containing catalyst	Waste catalyst, recovered mercury	• Mercury catalyst process	
Other production of chemicals and pharmaceuticals with mercury compounds and/or catalysts	Waste catalyst, recovered mercury	• Mercury catalyst process	
Production of mercury-added products	Unused raw material, recovered mercury		
Products and applications with intentional use of mercury			
Laboratory chemicals and equipment	Stockpiles of laboratory chemicals	• Mercury • Mercury chloride, etc.,	Include porosimeters.
Mercury metal use in religious rituals and folklore medicine	Excess mercury	• Mercury	
Lighthouse equipped with mercury bearings	Mercury in the bearing to float and revolve a lens apparatus, including mercury stored for replenishment		One expert questioned the relationship of this entry with the "light sources with mercury" listed under category B. It is understood that this is the use of mercury bearing, not a light source.
Secondary metal production			
Recovery of mercury	Recovered mercury	• Dismantling of chlor-alkali facilities • Recovery from mercury meters used in natural gas pipelines • Recovery from manometers, thermometers, and other equipment.	Includes recovery of mercury from mercury waste and contaminated soil. One expert questioned whether, for example, mercury recovered from decommissioning of chlor-alkali facilities should be listed here or as "intentional use of mercury in industrial production". It should be noted that paragraph 5 (b) of article 3 stipulates that excess

Source	*Examples of waste types*	*Remarks*	*Comments from experts*
			mercury from the decommissioning of chlor-alkali facilities should be disposed of using operations that do not lead to recovery, recycling, reclamation, direct re-use or alternative uses. "Recovery of gold from e-waste" was removed from the list, since it is not likely that waste consisting of mercury would arise from this process. This process is listed under category C.
Small-scale jewellery processing (artisanal recovery of gold waste in or near craft shops)	Recovered mercury	• Amalgamation	

B: Wastes containing mercury or mercury compounds

Source	*Examples of waste types*	*Remarks*	*Comments from experts*
Products and applications with intentional use of mercury			
Thermometers and other measuring devices with mercury	Used, obsolete or broken products	• Mercury	
Electrical and electronic switches, contacts and relays with mercury			
Light sources with mercury		• Vapour-phase mercury • Divalent mercury adsorbed on phosphor powder	
Batteries containing mercury		• Mercury, mercury oxide	
Biocides and pesticides	Stockpiles of obsolete pesticides.	• Mercury compounds (mainly ethylmercury chloride)	
Paints	Stockpiles of obsolete paints	• Phenylmercuric acetate and similar mercury compounds	One expert proposed the deletion of paints until enough supporting evidence was obtained. Needs further discussion.
Pharmaceuticals for human and veterinary uses	Stockpiles of obsolete pharmaceuticals	• Thimerosal • Mercuric chloride • Phenyl mercuric nitrate • [illegible] etc	

Source	*Examples of waste types*	*Remarks*	*Comments from experts*
Cosmetics and related products	Stockpiles of cosmetics and related products	• Mercury iodide • Ammoniated mercury, etc.,	
Dental amalgam fillings	Stockpiles of dental amalgam, removed fillings, capsules, equipment	• Alloys of mercury, silver, copper and tin	
Manometers and gauges	Used, obsolete or broken products	• Mercury	
Laboratory chemicals and equipment	Stockpiles of laboratory chemicals and equipment	• Mercury • Mercury chloride, etc.,	
Polyurethane elastomers	Polyurethane products		One expert questioned whether this should be listed under category B. Used or end-of-life polyurethane product is listed under C. Further discussion may be needed.
Miscellaneous product uses, mercury metal uses and other sources	Stockpiles	• Infra-red detection semiconductors with mercury • Ammunition and detonators • Bougie and Cantor tubes • Educational uses, etc.,	

C: Wastes contaminated with mercury or mercury compounds

Source	*Examples of waste types*	*Remarks*	
Extraction and use of fuels/energy sources			
Other coal combustion Coke production Extraction, refining and use of mineral oil Extraction, refining and use of natural gas Extraction and use of other fossil fuels Biomass fired power and heat generation	Flue gas cleaning residues (fly ash, particulate matter, wastewater, gypsum, sludge, etc.,), bottom ash Sludge generated at separator tanks and sedimentary sand tanks, mercury absorbers Oil refining catalyst	• Accumulation in bottom ashes and flue gas cleaning residues.	In relation to wastewater mentioned here and elsewhere, one expert noted that discussion was needed on the types of wastewater addressed under article 12, while releases to water were addressed under article 9. One expert strongly recommended the deletion of "extraction and use of fuels/energy sources" since the concentration was usually very low (lower than 1mg/kg or even 0.1mg/kg for coal fly ash, bottom ash, gypsum, etc.,), noting that it would be better not to cover every source from the outset. Another expert opposed the deletion on the grounds that there was a significant

Source	*Examples of waste types*	*Remarks*	
			concentration of mercury in fuels other than coal.
Primary (virgin) metal production			
Primary extraction and processing of mercury	Tailings, extraction process residues, flue gas cleaning residues, wastewater treatment residues, debris	• Pyrometallurgy of mercury ore	A report referred to in an expert's comment also highlighted waste rock, river sediments, among others.
Gold amalgamation	Tailings, extraction process residues, flue gas cleaning residues, wastewater treatment residues, debris	• Thermal treatment of gold • Industrial processing	"Sponge gold/gold production from ASGM sources" is listed as "products and applications with intentional use of mercury" in the Basel technical guidelines. One expert commented that gold amalgamation was practised only in ASGM, where flue gas cleaning and wastewater treatment were unlikely. Another expert pointed out that gold amalgamation was practiced in "fire gilding" or gold plating in certain countries. Another expert proposed the deletion of gold amalgamation because it was covered by article 7 of the Convention.
Metal (aluminium, copper, gold, lead, manganese, zinc, primary ferrous metal, other non-ferrous metals) extraction and initial processing	Tailings, extraction process residues, flue gas cleaning residues, wastewater treatment residues, debris	• Industrial processing • Thermal treatment of ore • Amalgamation	One expert requested clarification as to the relationship between this list and the provisions of paragraph 2 of article 11 on overburden, waste rock and tailings from mining. One expert proposed the deletion of aluminium, manganese, primary ferrous metal, other non-ferrous metal from the first column. The deletion of tailings and debris was also proposed. These were included in the original table in the Basel technical guidelines (except for debris). Needs further discussion.

Source	*Examples of waste types*	*Remarks*	
Production processes with mercury impurities			
Cement production	Process residues, flue gas cleaning residues, sludge	• Pyroprocessing of raw materials and fuels with naturally occurring mercury impurities	
Pulp and paper production		• Combustion of raw materials with naturally occurring mercury impurities	One expert proposed the deletion of this and the following entry. These were included in the original table in the Basel technical guidelines (except for debris). Needs further discussion
Lime production and lightweight aggregate kilns		• Calcination of raw materials and fuels with naturally occurring mercury impurities	
Intentional use of mercury in industrial production			
Chlor-alkali production with mercury technology	Solid waste contaminated with mercury, waste electrodes, process residues, soil, wastewater treatment residues, waste activated carbon	• Mercury cell • Mercury recovery units (retort)	
Production of alcoholates (e.g., sodium or potassium methylate or ethylate), dithionite and ultrapure potassium hydroxide solution	Solid waste contaminated with mercury, waste electrodes, process residues, soil	• Mercury cell • Mercury recovery units (retort)	
VCM production with mercuric chloride ($HgCl_2$) catalyst	Process residues, waste catalyst, wastewater treatment residues, waste activated carbon	• Mercury catalyst process	
Acetaldehyde production with mercury sulphate ($HgSO_4$) catalyst	Wastewater, waste catalysts	• Mercury catalyst process	
Polyurethane production using mercury-containing catalyst	Process residues, wastewater, waste catalysts	• Mercury catalyst process	
Gilding	Gilding residues		
Other production of chemicals and pharmaceuticals with mercury compounds and/or catalysts	Process residues, wastewater, waste catalysts	• Mercury catalyst process	
Production of products referred to in the next section of this table	Process residues, wastewater		
Products and applications with intentional use of mercury			
Use of mercury-added products	Wastewater treatment residues, solid wastes, contaminated soil	• Mercury; • Mercury chloride, etc.,	Includes waste from laboratories, dental clinics, etc.

Source	*Examples of waste types*	*Remarks*	
Polyurethane elastomers	Used or end-of-life products	• Elastomer waste containing mercury compounds	Includes decommissioned mercury-catalysed polyurethane flooring. One expert mentioned Polyisocyanide (Tartan; athletic ground flooring).
Mercury metal use in religious rituals and folklore medicine	Solid waste, wastewater treatment residues	• Mercury	
Objects treated with biocides, pesticides or paints containing mercury	Treated wood, vessels, paint flakes, contaminated soil, etc.		
Miscellaneous product uses, mercury metal uses and other sources	Wastewater treatment residues, solid wastes	• Infrared detection semiconductors with mercury • Bougie and Cantor tubes • Educational uses, etc.	
Secondary metal production			
Recovery of mercury	Materials contaminated by spillage during recycling processes, extraction process residues, flue gas cleaning residues, wastewater treatment residues	• Dismantling of chlor-alkali facilities • Recovery from mercury meters used in natural gas pipelines • Recovery from manometers, thermometers, and other equipment	One expert noted that "spillage" itself should be waste consisting of mercury if properly collected. Another expert noted that spillage on to wooden pallets, timber flooring, soil and carpet was not uncommon so the definition should not be limited to "consisting of".
Recovery of ferrous metals		• Shredding • Smelting of materials containing mercury	One expert proposed the deletion of this entry and the entry on the recovery of other metals, such as copper and aluminium. These were included in the original table in the Basel technical guidelines (except for debris). Further information would be needed to discuss whether these should be included.
Recovery of other metals, such as copper and aluminium		• Other mercury-added materials or products/components	
Recovery of gold from e-waste (printed circuit boards)		• Mercury • Thermal process	One expert proposed limiting this entry to "Recovery of gold from e-waste (printed circuit boards using mercury amalgamation)" or other specific process generating mercury wastes, and the deletion of the thermal process.

Source	*Examples of waste types*	*Remarks*	
			since there were only trace amounts of mercury in printed circuit boards. This was included in the original table in the Basel technical guidelines (except for debris). Further information would be needed to discuss how this should be described.
Small-scale jewellery processing (artisanal recovery of gold waste in or near craft shops)	Wastewater, extraction process residues, solid waste (including dust and ash)	• Amalgamation	
Waste incineration			
Incineration of municipal solid waste Incineration of hazardous waste Incineration of medical waste Sewage sludge incineration	Flue gas cleaning residues, wastewater treatment residues, incineration residues	• Unsorted mercury-added products and process waste • Natural mercury impurities in high volume materials (e.g., plastics, paper) and minerals	One expert proposed the deletion of this entry and the entry on the recovery of other metals, such as copper and aluminium. These were included in the original table in the Basel technical guidelines (except for debris). Further information would be needed to discuss whether these should be included. One expert proposed the deletion of these entries, since mercury was not a main pollutant in waste incineration, and fly ash, etc., was already managed as hazardous waste in many countries. Another expert pointed out that in some countries it was not properly managed. Needs further discussion.
Waste deposition/landfilling and wastewater treatment			
Controlled landfills/deposits	Wastewater, wastewater treatment residues, solid waste contaminated with mercury	• Mercury-added products and process waste Natural mercury impurities in bulk materials (plastics, tin cans, etc.,) and minerals	One expert proposed the deletion of "natural mercury impurities", while supporting including that phrase for the "incineration of hazardous waste". The rationale was that mercury might be emitted in the incineration process, whereas mercury was not condensed in landfilling.

Source	*Examples of waste types*	*Remarks*	
Diffuse deposition under some control			
Uncontrolled local disposal of industrial production waste			
Uncontrolled dumping of general waste			
Wastewater system/treatment	Wastewater treatment residues, slurries	• Intentionally used mercury in spent products and process waste • Mercury as an anthropogenic trace pollutant in bulk materials	One expert noted the contribution of dental amalgam in human waste, which was treated in municipal wastewater plants. The same expert also highlighted mercury contained in sludges used as fertilizers.
Construction/demolition waste	Mercury-contaminated rubbles, debris and soil	• Building materials contaminated with mercury or mercury compounds	
Land remediation activities	Mercury-contaminated soil	• Land contaminated with mercury from production or process facilities	One expert noted that there was a possibility of establishing thresholds for contaminated soil in the guidance under article 12 of the Convention. One expert noted that it might be necessary to distinguish between on-site and off-site remediation.
Dredging	Sediment and slurries contaminated with mercury		
Crematoria and cemeteries			
Crematoria	Flue gas cleaning residues, wastewater treatment residues, residual bone ash	• Dental amalgam fillings	
Cemeteries	Soil contaminated with mercury		

Note: Examples were taken from Basel Convention technical guidelines. Additional examples and comments received from experts are underlined.
Abbreviations: ASGM – artisanal and small-scale gold mining, VCM – vinyl chloride monomer.

C. Priorities in establishing mercury waste thresholds

1. Role of mercury waste thresholds

12. One expert summarized the functions of the mercury waste thresholds under the Convention as follows:

(a) To exclude from the scope of article 11 certain wastes, which in the absence of thresholds would be covered by the provisions of the Convention;

(b) To include in the scope of article 11 certain mercury wastes from mining, other than primary mercury mining, which in the absence of thresholds would not be covered by the provisions of the Convention.

13. A number of experts discussed the need for thresholds to classify waste leading to specific environmentally sound management. For example, the Basel Convention technical guidelines provided specific guidance on the management of waste consisting of, containing and contaminated with mercury. Other experts cautioned that, as the exercise pertained to the establishment of thresholds to determine whether certain wastes fell under the provisions of article 11 of the Convention, the development of thresholds to categorize mercury waste should be subject to a possible subsequent decision of the Conference of the Parties.

2. General priority

14. Some experts were of the view that priority should be given to types of waste that had greater potential for emission or release to the environment, and adverse effects on human health and the environment. Some experts also placed high priority on types of waste for which there existed cost-effective measures to control environmental releases of mercury. Another expert ranked the source categories of mercury waste in terms of the presence of mercury and its potential effects on human health and the environment, according top priority to the following three categories: production of primary metals (virgin), intentional use of mercury in industrial production, and products and applications with intentional use of mercury.

15. The majority of the experts provided comments explicitly mentioning the three categories of mercury waste as described in paragraph 2 of article 11. There was an emerging consensus that waste contaminated with mercury and mercury compounds was of high priority.

16. A number of experts identified waste contaminated with mercury and mercury compounds as the only category for which thresholds were needed. However, as described below, some experts gave high priority to other categories, with one observing that waste contaminated with mercury was the most difficult category and that work should begin with other easier categories. Further discussion is needed on these priorities.

17. A number of experts pointed out that mining waste needed to be addressed as a separate category.

3. Waste consisting of mercury or mercury compounds

18. A number of experts said that waste consisting of mercury was so obviously highly toxic that there was no need for thresholds for that category. Any mismanagement of such waste could seriously threaten human health and the environment and, for these experts, therefore, no thresholds were needed for that category and all such waste should continue to be covered by article 11.

19. One expert strongly disagreed with that view, stating that the Convention explicitly called for the development of thresholds. Presumably, all wastes in that category would easily exceed a threshold and be subject to article 11. However, clearly identifying them as subject to the threshold would make that point unambiguous in the event that a waste was, for some party, not self-evidently subject to article 11. Two other experts also assigned relatively high priority to that category of mercury waste, since it was the type of mercury waste that required the most stringent control and might therefore need to be distinguish from waste contaminated with mercury or mercury compounds. A number of experts pointed out that waste consisting of mercury and mercury compounds could be discharged in the form of mixture with other chemical substances.

20. Early in the commenting round, a 95 per cent threshold was suggested for elemental mercury. A number of experts commented on the 95 per cent limit mentioned in the earlier compilation document. Although two comments supported the use of a 95 per cent threshold, a number of experts pointed out that that was only a threshold to control the supply and trade of mercury (article 3). One expert strongly objected to using that value, since waste consisting of 85 per cent mercury would need the same level of control as pure mercury. One expert observed, however, that in the new situation

where mercury was internationally regulated, commodity mercury might become waste and it was only possible to define waste consisting of mercury by means of the widely used 95 per cent standard.

21. Regarding mercury compounds, article 2 of the Convention provides that "mercury compound" means any substance consisting of atoms of mercury and one or more of other atoms of other chemical elements that can be separated into different components only by chemical reactions. One expert noted that if the category was defined based on total mercury, it would be necessary to account for the fact that compounds would have lower percentages of mercury. For example, a waste consisting of 100 per cent calomel contained 85 per cent mercury.

4. Waste containing mercury or mercury compounds

22. A number of experts saw no need for developing thresholds for waste containing mercury or mercury compound. The waste that fell under this category was discarded or used products and applications in which mercury was used intentionally. If inappropriately managed, such waste would lead to emissions and releases of mercury and mercury compounds that would potentially threaten human health and the environment. Hence, for these experts, no thresholds were needed for category B wastes as they were of the view that such wastes should all continue to be covered by article 11.

23. One expert noted, however, that identifying mercury-containing products might not always be easy. By listing them as wastes that exceeded the threshold, based on knowledge of their mercury content, they could be clearly identified. A number of experts noted that annex A of the Minamata Convention only listed products for mercury phase-out (or phase-down) based on the current and future availability of alternative products, and therefore the waste management of mercury-added products should not be limited to annex A, although that list might represent a starting point.

24. One expert observed that, while many waste mercury-added products (e.g., thermometers, switches, fluorescent lamps) were easy to identify, there were categories that might sometimes, but not always, contain mercury and that were not readily distinguishable from their non-mercury alternatives. The latter categories could include button-cell batteries, paints, pigments, fireworks, mirrors and polyurethane flooring. The same expert assigned the highest priority to products identified in part I of annex A of the Convention and other end-of-life products that could readily be identified as containing mercury or mercury compound, and second highest priority to end-of-life products that might contain mercury or mercury compounds but which were difficult to identify or distinguish from their non-mercury alternatives, since threshold development would probably require more time and work.

25. Another expert assigned medium priority to establishing thresholds based on the types of products, since the amount of mercury typically added to the products should be known.

5. Waste contaminated with mercury or mercury compounds

26. The majority of experts assigned high priority to waste contaminated with mercury. A number of experts viewed this as a "catch-all" category (excluding mining wastes), which relied more on mercury content than listing.

27. One expert observed that this was the only category that needed a threshold that would exclude certain waste from the requirements of article 11, since the potential of the management of such wastes to cause emissions and releases threatening human health and the environment could vary depending on the type of waste and the content of mercury and mercury compounds therein.

28. Two experts suggested priorities for different types of waste listed in the table, but one expert commented that the basis for such prioritization was unclear. Another expert observed that the category was very broad, ranging, for example, from contaminated construction materials to residues of industrial processes, and a list of such wastes would assist parties to focus waste management efforts on the appropriate wastes. The table provides useful information that could be used to establish such a list.

29. Another expert prioritized waste in this category which included contaminated soil, industrial solid waste, sludges, filter cake, mine tailings. It might also include articles or materials that had become contaminated with mercury as a result of spills, such as on textiles, carpets and timber.

6. Overburden, waste rock and tailings from mining

30. Differing views were expressed with regard to the prioritization of mining waste. One expert included this waste as a highest priority task, expressing particular concern about tailings from gold, lead, zinc, copper and silver mining. Another expert commented that thresholds should be determined for mine tailings given that emissions and releases of mercury and mercury compounds from mine tailings could seriously threaten human health and the environment, whereas thresholds might not be

needed for overburden and waste rocks. Yet another expert observed that this was a complex issue requiring further discussion, and that it should be considered as a second priority.

31. Two other experts noted that overburden, waste rock and tailings from non-primary mercury mining generally contained mercury in the highly insoluble forms that were present in the original earthen materials, were already regulated nationally, and were managed on-site in specifically designed facilities where there was no exposure to the public, and therefore mining waste that was not from primary mercury mining was of a very low priority. One expert commented that this was not only an issue of human exposure and tailings being "far away", but that it was necessary to consider volatilization and releases to water bodies.

D. Possible approaches to establishing threshold

1. Three approaches – total mercury content, release potential and listing approach

32. Three approaches to establishing thresholds have been identified, namely, total concentration of mercury in a waste, measures of the release potential of mercury in a waste, and a qualitative determination (i.e., a listing approach).

33. Total mercury content of a waste represents the most straightforward type of threshold. It identifies the presence of mercury in the waste, and assumes that the more mercury present, the higher its potential to pose an actual hazard. It does not attempt to identify the risk that may be posed by the waste (i.e., the likelihood of exposure with resulting adverse health effects). Any total concentration threshold measure will always, therefore, be somewhat arbitrary, although it may be possible to achieve consensus on particular values for different wastes being considered.

34. Measures of release potential could be based on the form of mercury in the waste, or aspects of the waste matrix that facilitate or retard release to the environment, and may be an appropriate basis for thresholds for some wastes. Measures of release potential are, however, often linked to particular management conditions (e.g., leach testing to assess groundwater contamination potential of wastes managed on land), and any single test may not address all release pathways.

35. Differing views were expressed as to the use of the leaching test. Some experts recommended that approach, especially for waste contaminated with mercury and mercury compounds, noting that such thresholds were used in some jurisdictions for regulating the management of mercury waste. Other experts viewed that approach as inadequate for establishing mercury waste thresholds under the Convention. The leaching procedure is typically a measure of risk that landfilled mercury waste poses to nearby drinking water wells. Accordingly, this exposure pathway fails to take into account the principal mercury exposure pathways of concern, such as inhalation, dermal exposure and the atmospheric emissions which contribute to the global pollution pool, eventually resulting in contaminated aquatic food sources. Basing the threshold on a leaching standard presumes the waste will be landfilled, since the procedure has no relevance to waste undergoing incineration or open burning. For all those reasons, these experts stated that where a threshold was needed for jurisdictional purposes, it should be based upon total concentrations, not leaching levels, although there may ultimately be a role for leaching standards in the waste management requirements, particularly for wastes destined to be landfilled. Further discussion is needed on this approach.

36. A qualitative (or listing) approach would recognize that most waste or end-of-life mercury-containing devices (i.e., devices with mercury added intentionally for a functional purpose) are identifiable as such, and therefore knowledge of these wastes could be a reliable basis for concluding that they "exceed a threshold". Similarly, waste consisting of mercury or mercury compounds could also be included based on the knowledge that most of the waste is elemental mercury or a mercury compound, without the need for testing.

37. One expert, discussing the validity and practicality of these approaches, suggested the following approaches for establishing thresholds:

(a) Waste consisting of mercury or mercury compounds: mercury concentration by weight or list of waste. It appears reasonable to specify mercury concentration above which stabilization or solidification is required. However, if it is difficult to agree on specific values, listing may be an alternative approach;

(b) Waste containing mercury or mercury compounds: list of waste or mercury concentration by weight. Mercury-containing products are relatively easy to identify and it would be too much of a burden to request the analysis of mercury content. However, since there are product categories where it is not easy to determine whether they contain mercury, mercury concentration may be an option;

(c) Waste contaminated with mercury or mercury compounds: mercury concentration by weight, together with acceptance criteria for disposal facilities. Total mercury content will be appropriate for determining whether mercury recovery is required. For final disposal, countries may have their own acceptance criteria for final disposal.

38. The views expressed by other experts on the first two categories appear to be consistent with that suggestion. For waste consisting of mercury, one expert proposed a 95 per cent threshold for mercury, but other experts observed that further discussion was required on the specific value. Some of the experts who did not see the need for thresholds for these types of waste viewed the listing of wastes as helpful.

39. With regard to waste contaminated with mercury, divergent views were expressed. Some experts proposed the use of total mercury concentration, since the threshold should be based on the intrinsic property of the waste irrespective of the waste management technology. Other experts proposed the use of the leaching test, expressing the view that it better reflected the risk to human health and the environment of mercury released to the environment. Yet other experts suggested that further work was needed to assess the applicability of the three approaches to specific waste types.

2. Mining waste

40. One expert, while questioning the need for establishing thresholds for this type of waste, observed that if any specific thresholds were considered, the natural background levels of mercury at the mine site and the risk of mercury exposure to humans and the environment from these materials needed to be taken into account.

41. One expert suggested the use of the leaching test and other measures of releases, noting that mining wastes would never be incinerated. Another expert proposed setting a threshold based on leachability as the first tier in determining if overburden, waste rock and tailings might be considered a "mercury waste" under the Convention, and said that if, and only if, the leachability threshold was exceeded, a second tier should come into play, which would be a site-specific threshold based on local precipitation/infiltration, specific chemistry, and risk of exposing downgradient human populations or biota. Still another expert suggested listing the types of ore tailings subject to the Convention coverage, regardless of concentration.

3. Issues to be considered in establishing thresholds

42. Experts were invited to present their views on issues to be considered in establishing thresholds. The comments received include the following.

(a) The waste categorization developed for the Convention must be easy to understand and apply in the field, including by developing countries. Accordingly, categorizations requiring testing in the field by customs or other government officials for purity or other chemical characteristics, or requiring the identification of the source of the waste, may be unworkable at present. Similarly, categorizations that were difficult to explain or required an extensive technical background may also be unworkable;

(b) In developing thresholds, national regulations and technical guidelines, as well as the requirements of the technical guidelines under the Basel Convention, should be taken into account;

(c) One expert observed that the release potential of mercury and its risk should be assessed. Another expert observed, however, that if mercury wastes were required to be managed according to the toxicity of each compound in the wastes, the analysis of each mercury compound for one type of mercury waste became a prerequisite. Owing to the high costs of analysis, it did not seem practically possible in the view of this expert that such management be introduced in each party;

(d) Since each country has different types of landfill (those for hazardous wastes or for non-hazardous wastes) as well as construction/operation standards and acceptance criteria for each type of landfill, it might be preferable to adopt their acceptance criteria as the thresholds. If there are countries that have not established such criteria, parties need to indicate the basic acceptance criteria as a reference for these countries;

(e) The availability of analytical methods will influence the decision about how to apply any threshold concentration to mercury compounds. All the basic analytical determinative methods for testing mercury wastes produce total mercury concentration as their result. Sampling and pre-treatment methods are also important;

(f) If all mercury-added product categories are to be included in the list, the list will become too long, which makes it difficult to judge whether or not a waste in question is a target waste. It is necessary, therefore, to establish a policy for the development of a list, for example firstly listing

product categories that may have an adverse impact on human health and the environment if they are not managed in an environmentally sound manner, and then expanding the list based on the progress of relevant measures taken by parties. It is also necessary to discuss how to keep the list updated.

43. One expert sought clarification as to whether the thresholds for the Minamata Convention need to be linked to the provisions of the Basel Convention on hazardous waste. According to that expert, if the thresholds needed to be aligned with the definition of hazardous waste under the Basel Convention, the thresholds might be too high to assure the sound management of mercury waste.

4. Work needed to establish thresholds

44. Issues that need further discussion identified in the previous paragraphs include the following:

(a) Description of certain types of waste, such as residues from waste treatment;

(b) Priorities for waste other than waste contaminated with mercury or mercury compounds;

(c) Which approach (total mercury content, release potential and listing approach) should be applied for specific types of waste.

45. In addition, experts suggested some specific tasks including the following:

(a) Survey of national information to be conducted, including the threshold for requiring the recovery of mercury, and acceptance criteria for waste disposal facilities;

(b) Information on mercury concentration in waste to be collected;

(c) Parties to be requested to provide types of waste not covered in the table, including the list of mercury-added products;

(d) Information on available methods for sampling, pre-treatment and analysis of mercury waste to be analysed, including their cost.

46. A number of experts observed that face-to-face meetings or conference calls would be needed for further work.

UNITED NATIONS

MC

UNEP/MC/COP.2/7

Distr.: General
6 August 2018

Original: English

United Nations Environment Programme

Conference of the Parties to the Minamata Convention on Mercury
Second meeting
Geneva, 19–23 November 2018
Item 5 (d) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: guidance on the management of contaminated sites

Guidance on the management of contaminated sites

Note by the secretariat

1. At its first meeting, the Conference of the Parties to the Minamata Convention on Mercury considered the development of guidance in relation to the management of contaminated sites as required pursuant to paragraph 3 of article 12. In its decision MC-1/20, the Conference of the Parties requested the secretariat, drawing on previously submitted information and work undertaken in other forums and using the outline of the structure and content of the guidance agreed by the Conference of the Parties as a basis, to prepare initial draft guidance on contaminated sites and circulate it electronically to nominated experts, who were to provide comments to the secretariat.

2. The decision also indicated that the secretariat should provide a revised version of the guidance and circulate it to the experts for consideration and further electronic discussion. The initial draft guidance was made available in late March 2018, as nominations of experts were still being received. The comment phase was thus extended until the end of May. A significant number of comments were received in the early weeks of June and some were received in July. Comment submission delays and the extensive revisions resulting from the often divergent comments meant that there was insufficient time for the second commenting phase provided for in the road map for the preparation of the draft guidance. The revised draft guidance prepared taking into account the experts' comments is being submitted to the Conference of the Parties for consideration at its second meeting and for further recommendations. A decision on possible further work, taking into account the fact that only one comment phase took place in the period between the first and second meetings, is presented in annex I to this note, while the draft guidance is presented in annex II.

Suggested action by the Conference of the Parties

3. The Conference of the Parties may wish to consider the draft guidance on the management of contaminated sites and further recommendations, and to consider requesting further work on the guidance.

* UNEP/MC/COP.2/1.

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Annex I

Draft decision MC-2/[XX]: Guidance on the management of contaminated sites

The Conference of the Parties,

Recognizing the need to assist Parties in the environmentally sound management of contaminated sites through the provision of guidance,

Noting the draft guidance prepared by the secretariat in consultation with nominated experts,

Requests the secretariat:

(a) To call for additional comments on the draft guidance presented to the Conference of the Parties at its second meeting;

(b) To prepare a revised version of the draft guidance;

(c) To publish the revised draft guidance for comments by all interested stakeholders;

(d) To present the revised draft guidance to the Conference of the Parties at its third meeting for consideration and possible adoption.

Annex II

Guidance on the management of contaminated sites

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A. Introduction

1. The Minamata Convention on Mercury contains provisions on the identification and management of mercury-contaminated sites, including the adoption of guidance on the management of contaminated sites by the Conference of the Parties. The present document provides guidance on the main elements of the identification and management of contaminated sites for the reference of parties who take action to manage such sites. It is intended for a range of possible users. It provides basic information on the effects of mercury, as well as guidance on managing sites, from site identification and detailed site investigation to the decision process for site management and, where appropriate, remediation. For those planning detailed management of a particular site, additional technical information can be found in the references listed at the end of the guidance.

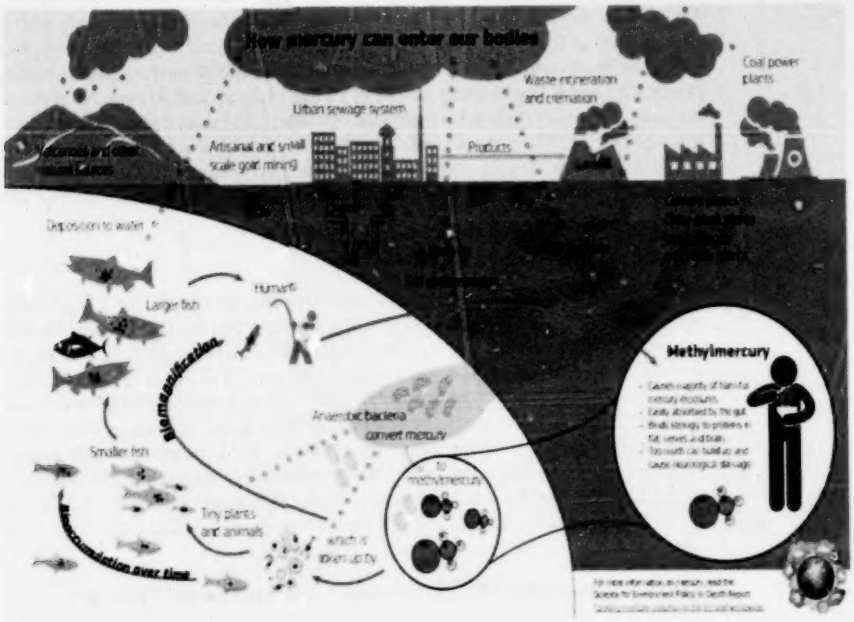
2. The guidance has been prepared in accordance with article 12 of the Convention. It does not establish mandatory requirements, nor does it attempt to add to or subtract from a party's obligations under article 12. It is recognized that, for technical, economic or legal reasons, some of the measures described in the present guidance may not be available to all parties.

Risks to human health and the environment

3. Mercury is a global threat to human health and the environment. Once released into the environment, mercury can travel long distances and persist in the environment, circulating between air, water, sediments, soil and living organisms until it is eventually removed into deep ocean sediments or mineral soils. The environmental behaviour and toxicological properties of different mercury compounds vary. Methylmercury presents the greatest risk to human health and wildlife. It is mostly produced in anaerobic aquatic ecosystems through natural bacterial process under certain conditions.

4. Mercury bioaccumulates and biomagnifies, concentrating as it moves up the food chain, so that the highest levels are found in predatory species such as tuna, marlin, swordfish, sharks, marine mammals and humans. There can be serious impacts on ecosystems, including reproductive effects on birds and predatory mammals. High acute or chronic exposure to mercury is a serious risk to human health and to the environment.

5. Effects on human health include effects on the brain, heart, kidneys, lungs and immune system of individuals of all ages. Elevated levels of methylmercury in the bloodstream of unborn babies and young children can harm the developing nervous system. Neurological and behavioural disorders in humans may be signs of significant mercury exposure, with symptoms including tremors, insomnia, memory loss, neuromuscular effects, headaches, and cognitive and motor dysfunction. In workplaces where mercury is used, people may be at risk of inhaling mercury vapour or of dermal exposure from normal work practices (in industrial, medical or dental settings or artisanal and small-scale gold mines) or from spills. For the general population, however, the most usual form of direct exposure is through consuming fish and seafood contaminated with methylmercury. Once ingested, 95 per cent of the chemical is absorbed through the gastrointestinal tract.



Global use of mercury

6. Mercury is a metal whose unique properties have led to a range of uses. A liquid at room temperature, it has been used in switches and relays, as well as measuring devices, where it enables precise determination of changes in temperature. It has been used as a catalyst in a number of industrial processes. Mercury's ability to form amalgams with other metals has led to its use in activities such as artisanal and small-scale gold mining (ASGM) and dentistry.

7. The industrial and manufacturing processes that use mercury have the potential to release mercury that could contaminate the environment. Contaminated sites pose an environmental risk in two ways: the contaminated site itself (e.g., a facility or spill site) can be a source of exposure for anyone who enters the site, and the site can be a source of mercury release to the surrounding environment. When mercury moves off site, remediation includes the removal of mercury from both the site of initial contamination and the environmental media to which it may have migrated (e.g., groundwater, surface water, sediments).

8. A wide range of mercury-added products are still produced globally, including batteries, lamps, measuring devices (such as thermometers), cosmetics and pesticides. The levels or quantity of mercury in these products is generally very low; however, mishandling of large quantities of such materials as products or waste can result in releases to the environment. Mercury amalgam is still widely used in dentistry, which can result in mercury releases to waste water from dental offices and to air from crematoria.

9. Industrial processes that use mercury either as a catalyst or as part of an electrical circuit are also still in use globally. These processes include chlor-alkali production, where very large volumes of mercury are sometimes used on site, resulting in facilities that can be heavily contaminated with mercury. Mercury has also been used in acetaldehyde production. Other industrial processes that may use mercury include vinyl chloride monomer production (for use in polyvinyl chloride), sodium or potassium methylate or ethylate production and polyurethane production. Any of these manufacturing processes has the potential to contaminate the production site as a result of the process itself, spills resulting from poor handling or accidents or mismanagement of the mercury waste generated by the process.

10. Mercury is used extensively in ASGM, where it is mixed with gold-bearing ore. The mercury binds to the gold, forming an amalgam that is then heated to release the mercury as a vapour, leaving the gold. The informal nature of many small-scale gold mining operations means that there are few, if any, controls on mercury use and release, often resulting in high levels of worker exposure and site contamination. Additionally, entire families or groups of people can be exposed to mercury vapour in the house or warehouse where processing takes place.

11. Mercury can also be emitted by a number of other industrial-scale activities where it is a contaminant in feedstock materials or a by-product of production. Examples include coal burning (in power plants and industrial boilers), non-ferrous metal smelting and roasting, cement clinker production and waste incineration. Most of this mercury can be captured through pollution control measures; however, this in turn produces mercury-contaminated solid and liquid wastes that need to be managed safely. Mismanagement of waste, particularly waste water, can result in releases of mercury to water, land and soil. Industrial-scale mining activities, particularly where the ore has a high mercury content, can also result in releases of mercury to air, land and water systems, while the mine tailings may be heavily contaminated with mercury.

Mercury emissions and releases

12. The 2013 Global Mercury Assessment indicated that the largest sources of anthropogenic emissions of mercury to air are ASGM and coal combustion (UNEP, 2013), followed by the production of ferrous and non-ferrous metals and cement production. The 2013 assessment also evaluated mercury releases to water from point sources of mercury emissions, contaminated sites and ASGM sites. The assessment found that global anthropogenic emissions of mercury to air in 2010 were estimated at 1,960 metric tons, while anthropogenic releases to water were at least 1,000 metric tons. Contaminated sites were estimated to release 8–33 metric tons of mercury per year to water and 70–95 metric tons of mercury to air, therefore contributing a relatively small amount to the global total. Other studies (Kocman and others, 2013) have found higher levels of releases to water, estimated at 67–165 metric tons of mercury per year. These figures indicate that local communities can have significant exposure to mercury from contaminated sites.

Obligations under the Minamata Convention on Mercury

13. Article 12 of the Minamata Convention sets out the following obligations with regard to contaminated sites:

1. Each Party shall endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.

2. Any actions to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating, where appropriate, an assessment of the risks to human health and the environment from the mercury or mercury compounds they contain.

3. The Conference of the Parties shall adopt guidance on managing contaminated sites that may include methods and approaches for:

   (a) Site identification and characterization

   (b) Engaging the public

   (c) Human health and environmental risk assessments

   (d) Options for managing the risks posed by contaminated sites

   (e) Evaluation of benefits and costs, and

   (f) Validation of outcomes.

4. Parties are encouraged to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing and, as appropriate, remediating contaminated sites.

14. This guidance has been developed in accordance with paragraph 3 of article 12 of the Convention and is organized around the main methods and approaches listed therein. It also references national policies in a number of countries.

B. Site identification and characterization

Site identification

15. Paragraph 1 of article 12 obliges parties to endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds. This language implies development of an approach that involves a nationwide review of the extent of each party's contaminated site problem. This will in most cases mean starting by assembling information that identifies facilities that may have engaged in manufacturing likely to result in mercury releases. As noted above, this will include both actively used and abandoned sites of manufacturing that uses

mercury or mercury compounds in its processes or products, ASGM operations, gold and other non-ferrous metals mining operations and other industrial operations. This initial identification of sites and initial estimates of the magnitude of contamination and potential for mercury release and exposure of populations will enable nations to begin prioritizing their response to their contaminated sites.

16. A first step in developing a contaminated site evaluation and management programme is to clearly define what is meant by contaminated site. The term "contaminated sites" is not specifically defined in the Convention text. The Mediterranean Action Plan guidelines on best environmental practices for environmentally sound management of mercury contaminated sites in the Mediterranean (MAPUNEP, 2015) define a contaminated site as "a place where there is an accumulation of toxic substances or residues which may affect the soil, groundwater, sediments and, in the case of mercury, even air to levels that pose a risk to the environment or human health or be above the safe limits recommended for a specific use". The World Health Organization's Regional Office for Europe defines contaminates sites as "areas hosting or having hosted human activities which have produced or might produce environmental contamination of soil, surface or groundwater, air, food-chain, resulting or being able to result in human health impacts" (WHO/EURO, 2013). Other definitions include the concept of sites where substances occur at concentrations above background levels and pose or are likely to pose an immediate or long-term hazard to human health or the environment, or where substances occur at concentrations exceeding levels specified in policies and regulations. As proposed land uses can change rapidly, consideration may need to be given to a more generic definition. Some suggest the need to define what comprises a "site", noting that a site may not necessarily be limited to a terrestrial form such as a field, a forest or a hill, but can include aquatic environments such as streams, rivers, lakes, swamps, damp-lands, estuaries and bays in cases where mercury contamination flows into water areas from, for example, ASGM sites (IPEN, 2016). As mercury is a naturally occurring element, there may be background levels of mercury that need to be taken into consideration in site characterization.

17. There seem to be two approaches to identifying potential contaminated sites: an exhaustive approach and an individual approach. The exhaustive approach starts with the implementation of a nationwide review of historical land use and the creation of an initial list of potentially contaminated sites. The list is then prioritized and the sites that require further investigation are identified. This approach can be effective when developing a comprehensive national plan for countermeasures against mercury-contaminated sites. The individual approach is based on risk management, and identifies sites that require further investigation through reviews of historical land use in cases where there is a risk of diffusing mercury contamination, such as when changing the character of the land. This approach is particularly effective and efficient when a country has performed some degree of contaminated site identification and applied environmentally appropriate management measures. For example, as contaminated sites such as properly managed waste disposal sites present no risk of contamination being diffused unless there is a need to change the land character, they do not need to be included in the targets for identification.

18. A review of the historical land use is an important aid in identifying potential contaminated sites (CCME, 2016). This can form the first step in identifying sites that may require further investigation. Until contamination has been demonstrated through site investigations, such sites can be referred to as "suspected" contaminated sites. In some jurisdictions, all proven and suspected contaminated sites are incorporated into an online database. If the status of a site changes (for example, it is demonstrated to be free of contamination), this is indicated in the database. There are a range of possible sources of site contamination, including mercury storage, manufacturing of mercury-added products, the use of mercury in manufacturing processes, mining activities (including ASGM and industrial mining activities), point sources of mercury emissions, and waste management. Sources such as the manufacturing of mercury-added products, the use of mercury in manufacturing processes and point sources of mercury emissions may include not only activities cited in the annexes to the Minamata Convention but also additional activities not controlled under the Convention. It should be noted that while there will be a primary contaminated site, there may also be associated secondary sites with contamination because of run-off, leaching or migration from the primary site. In some cases, particularly with run-off into wetlands or other sensitive ecosystems, contamination at the secondary site may consist mainly of methylmercury following bacterial transformation, or of other forms of mercury such as mercury sulphide, which may be generated through the sulphurization of mercury by sulphur content in the soil. In many countries, there may be limited knowledge of the historical uses of sites, particularly for sites where artisanal activities have been undertaken. Where possible, information on potential contaminated sites should be maintained in a database.

19. In the case of ASGM, identification of sites can be particularly problematic owing to the number of potentially contaminated sites, the informal (and sometimes illegal) nature of the activity

and the lack of formal records. It may be necessary to identify a cluster or region of sites that could be affected by artisanal mining and then work within that area to identify individual sites of concern.

20. To develop a preliminary national inventory of suspected or potential contaminated sites, government agencies can pool records of current and historical activities or land uses such as those mentioned above to form the basis for further investigation. In some jurisdictions, government agencies, businesses and private landowners are required by law[1] to notify the competent environmental authorities if they hold land that is suspected or known to be contaminated, failing which they face financial penalties.

21. In many cases, suspected contaminated sites can be initially identified by the following means (UNEP, 2015):

- Records identifying past industrial or other activities at the site
- Visual observation of the site conditions or attendant contaminant sources
- Visual observation of manufacturing or other operations known to have used or emitted a particularly hazardous contaminant
- Observed adverse effects in humans, flora or fauna possibly caused by their proximity to the site
- Physical or analytical results showing contaminant levels
- Community reports to the authorities regarding suspected releases

Site characterization

22. Once potential contaminated sites have been identified, steps should be taken to further investigate the sites that pose the greatest risk (because of factors such as location and environmental issues) to determine the contamination levels of and key risks posed by individual sites.

23. The development of a conceptual site model for the site can be a useful step. A conceptual site model is a visual representation and narrative description of the physical, chemical and biological processes occurring, or that have occurred, at a site. It should tell the story of how the site became contaminated, the extent of contamination, what media are contaminated, how the contamination was and is transported, where the contamination will ultimately end up and the population and ecosystems it may affect (CCME, 2016).[2] Consideration should be given to the chemical specificity of mercury in such a model, as well as other pollutants that may be present. Other factors that could be included are the ways that humans interact with a contaminated site, ranging from high frequency use, such as in residential areas, to lower frequency use, such as in recreational areas. The uses of groundwater from the area may also be important, and whether they are potable or non-potable uses. The conceptual site model should be updated as new information becomes available. The steps involved in developing a conceptual site model for each site could be useful for setting priorities for further investigation of particular sites. Prioritization could be based on not only sites where mercury levels are expected to be the highest but also sites that might have the greatest impact on ecosystems or populations.

24. The potentially contaminated sites identified can be further characterized through assessment protocols for both screening level assessments[3] and detailed assessments. Screening level assessment can be a useful tool for distinguishing between sites of greater and lesser concern so that resources can be focused on the most significant problems.

25. Assessment of a site should be set within the context of "investigation objectives", such as:

- Determining the site use history
- Characterizing the types of contaminants present at the site
- Determining the extent and distribution of contamination
- Developing a deeper understanding of the geology and hydrogeology of the site

[1] See, for example, Government of Western Australia, Western Australian Contaminated Sites Act 2003, Part 2, Division 1, sect.11 (3), available at https://www.legislation.wa.gov.au.

[2] Health Canada has also developed a tool for systematically developing a conceptual site model. The tool is available upon request from Health Canada's Contaminated Sites Division, via https://www.canada.ca/en/health-canada/corporate/contact-us/contaminated-sites-division.html.

[3] See, for example, https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.

- Characterizing the actual migration of contaminants (fate and transport, receptors and relevant environmental and exposure pathways) and determining potential migration
- Assessing the actual exposure and potential for exposure of the local population and the environment.

26. Other investigation objectives may be set for an individual site to address specific local concerns.

27. Once the investigation objectives have been established, a sampling and analysis plan should be developed. This plan should flow from the available site information and investigation objectives. The sampling and analysis plan should include the following elements:

- Review of existing data, including identification of real and potential sources, both primary and secondary
- Pre-mobilization tasks, including preparation of a health and safety plan and location of utilities and structures that could affect or be affected by detailed investigations (this step is intended to ensure that sampling or investigation activities do not affect the health and safety of workers, bystanders or others)
- Sampling media, data types and investigation tools, including decisions about which media to sample (soil, sediment, groundwater, soil vapour, air, biota, surface water, etc.) (sampling can be used to determine such things as chemical concentration, physical properties and leachability of contaminants)
- Sampling design
- Sampling and analysis methods and quality assurance project plan

28. Any existing national site sampling and analysis protocols should be evaluated in terms of whether they are appropriate for meeting the objectives of the Convention.

29. Sampling should be designed to work towards the objectives of the assessment, which are to determine the contaminants present at the site, establish their distribution within the site and locate hotspots that can lead to unacceptable risk to human health or the environment. A sampling strategy is developed on the basis of the information collected and takes into account the conceptual site model to define the sampling pattern; density, number and distribution of sampling points, type of sampling (one stage or multi-stage), type of samples (single or composite); sampling depth (one sample should be taken very near the surface owing to the possibility of direct contact, ingestion or inhalation) and depth intervals; and the contaminants of interest (mercury, methylmercury and/or other mercury compounds). Groundwater should also be sampled whenever there is a suspicion that the water table may have been reached by the contamination or intersected during drilling of the boreholes.

30. Sampling methodologies have been considered as part of a project funded by the Global Environment Facility for the development of a plan for global monitoring of human exposure to and environmental concentrations of mercury. Standardized sampling methodologies are available, including for air (both active and passive sampling, as well as wet deposition), biota (sampling of muscle tissue for total mercury) and human biomonitoring (with the choice of matrix dependent on the type of mercury exposure experienced by the population in question). Moreover, some countries have standard sampling and analysis methods for other environmental media, such as soil. [*A reference to a soon-to-be-published report containing WHO protocols and other standardized sampling methodologies will be inserted here once it is available.*]

31. Sampling methodologies include one where land is divided into small sections and the soil in the centre of each section is sampled, and another where sampling points are determined using a conceptual site model. Depending on temperature and the container used to transport the soil samples from the sampling site to a place where they are analysed, mercury could volatilize, leading to inaccurate assessments. There is also an ISO standard for soil sampling (ISO 18400).

32. Once the assessment has established the risk, such as the presence or absence of an exposure route, it is important to prioritize the work required to manage the risk. In other words, a determination needs to be made as to whether the land requires immediate remediation or whether it would be sufficient to pay special attention to the risk of diffusing the contamination by disturbing the contaminated soil – by construction work, for example.

C. Engaging the public

33. Engaging with the public, particularly on sensitive issues such as the presence of nearby contaminated sites, is important for the successful management of issues and sites. Public engagement is often coordinated through government agencies at the local, regional or national level that have been assigned the responsibility for managing contaminated sites. There are many terms that describe the concept of "public engagement", including "public participation" "community participation", "community involvement", "community engagement", "stakeholder involvement" and "stakeholder engagement" (National Environmental Justice Advisory Council, 2013). Public consultation is an important element of sustainable remediation and is even required by legislation in certain jurisdictions. The emphasis in public engagement is to ensure that people (or groups) who could be affected by or involved or interested in an action are informed and included in the decision-making process according to their roles and responsibilities. It is therefore important to begin engaging the public early in the process of identification or detailed assessment of a contaminated site. Local knowledge can be very important for identifying potentially contaminated sites and deciding on the soil sampling strategy.

34. There are a number of elements that should be considered when setting up a public consultation process. First, effective communication, along with a two-way process of transmitting and receiving information, is important for increasing understanding among stakeholders. Scientific information should be disseminated through the most effective means for the community involved to narrow the gap between real and perceived risk. Engagement is just as important when the risks are perceived, to ensure that concerns are addressed. While there are common elements of engagement, the approach should be tailored to the specific, unique needs of the individual community. There are a number of tools and methodologies available for setting up a public consultation process.[4]

35. It is important that community members see themselves as stakeholders in the issue at hand. Community outreach should target different levels. Landowners or residents living near or on the site, communities affected by pollution from the sites and other industries in the area who might be affected by the pollution can all be considered stakeholders. Site managers and workers employed at currently active sites are also stakeholders; note, however, that if the site contamination has resulted from mishandling of mercury waste or products, for example, the source issue should be addressed before any additional action is taken. In some cases, there may be local community groups who can speak on behalf of the community as a whole or for segments of the community, such as non-governmental organizations and public health workers. In some cases, particularly where there are long-standing issues between stakeholders, it may be beneficial for consultations to be run through an independent third party (such as a consultant or an academic). Such a third party might be involved purely for the public outreach part of the process or be engaged in other activities associated with the identification or even the potential remediation of contaminated sites.

36. Quality of input should be emphasized over quantity, and engagement should be focused at least as much on gaining information from the community as on providing information to the community. It is important that the community engagement process be under way throughout the site investigation, management and/or remediation activities, as the management phase can involve significantly increased risk to adjacent communities. Excavation of contaminated materials and in-situ treatment can release dust, vapours and odours. A useful engagement mechanism can be the establishment of a community consultation committee where technical, practical and anecdotal information can be exchanged between the authorities, the site contractors and the community to ensure a shared understanding of proposed activities at the contaminated site. Such a committee can also be a useful forum for considering monitoring programmes (for vapour, dust, etc.) that might be introduced at and around the site to address community concerns during the management phase.

37. The expertise of the local community members should be recognized, as they may have the greatest knowledge and experience of the history, effects and impact of contaminated sites, as well as any changes in the effects over time. This could contribute to an understanding of what issues need to be evaluated. A comprehensive approach to the management of contaminated site is one that closely involves local community members and considers them as the focus of activities affecting the community.

38. The process of engaging the public could begin with giving information to the community involved. Information provided at this stage could include background information about the site, including information on past uses and the suspected nature of the contamination. This can be key to getting community cooperation and compliance, particularly with the initial measures that may need to

[4] See, for example, https://www.epa.gov/superfund/superfund-community-involvement-tools-and-resources.

be taken (for example, installing fencing to prevent entry to contaminated areas), as well as with site remediation activities. Ongoing activity at the site might make such engagement more difficult. Other information that should be provided includes a statement on how the community is being asked to engage, as this assists in setting common expectations for the work. An initial timeline for activities, including any deadlines for submissions or production of reports, should also be provided. The initial information can be provided through the distribution of printed material (such as flyers) directly within the community or through publication in local or community newspapers or on relevant websites. Local radio and television stations can be used to disseminate information and publicize key activities. Contact information should be provided so that those interested in obtaining further information can do so.

39. An initial plan setting out the ways in which the public will be engaged should be provided, including a timeline for the proposed engagement activities. Where inputs are being solicited, information should be provided on how the information will be collected and how it will be used. Public engagement activities can include public meetings, which may be held at central community locations, or, in some cases, at the affected site. Public meetings can have different formats, and different types of meetings may prove useful at different stages of the work. "Town hall" meetings, where key individuals speak to major discussion points followed by a question and answer session, can be useful for initial engagement, while workshop or design meeting formats can be useful at later stages to increase interaction and arrive at agreed conclusions. Consideration should also be given to creating opportunities for individuals to provide input in a confidential way, to avoid any possible pressure from facility owners or operators, particularly on workers.

40. Different methodologies for engaging with the public may be appropriate, depending on the phase of the process (site identification, investigation, remediation, aftercare, etc.). The results of the public consultation process and the decisions on future activities should be disseminated in a similar manner as the initial information at the start of the engagement process.

D. Human health and environmental risk assessments

41. The hazards of mercury are well recognized, with extensive scientific information available on the effects of exposure to mercury, including elemental mercury, inorganic mercury and methylmercury. There is, however, a need to ensure that information is available to the broader public.

42. According to the World Health Organization (WHO), elemental mercury and methylmercury are toxic to the central and peripheral nervous systems. The inhalation of mercury vapour can produce harmful effects on the nervous, digestive and immune systems, the lungs and the kidneys, and can be fatal. The inorganic salts of mercury are corrosive to the skin, eyes and gastrointestinal tract and may induce kidney toxicity if ingested. Neurological and behavioural disorders may be observed after inhalation, ingestion or dermal exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. Mild, subclinical signs of central nervous system toxicity have been seen in workers exposed to an elemental mercury level in the air of 20 $\mu g/m^3$ or more for several years. Reported effects on kidneys range from increased protein in the urine to kidney failure. Permanent effects on the developing nervous system have been observed after exposure of foetuses and children, meaning that these groups are defined as being particularly vulnerable to mercury exposure (WHO, 2017).

43. The environmental effects of mercury exposure, particularly on high-level predators with potentially high dietary exposure, can include decreased reproductive success and impaired hunting ability.

44. Contaminated sites can result in locally increased levels of mercury (as well as other pollutants), which may pose risks to both humans and the environment. Drinking contaminated groundwater or surface water can result in long-term exposures, as can eating fish and seafood living in contaminated surface water. Contaminants may also be taken up by food crops grown on or near contaminated sites. Soils contaminated by mercury, especially methylmercury, can form subsurface vapour (also termed soil vapour) and subsequently migrate into overlying buildings' structures, becoming a significant source of indoor air inhalation exposure that should be considered (US DHHS, Agency for Toxic Substances and Disease Registry) Sites where exposure to mercury vapour is likely seem to be limited to those contaminated by metallic mercury, such as contaminated sites around ASGM operations.

45. Contaminated sites may result in leaching or surface runoff of mercury, which can contaminate groundwater or surface water, resulting in potential exposure to elemental or inorganic mercury through drinking water. A site's potential to contaminate either groundwater or surface water should therefore also be considered. Under anaerobic conditions, mercury may be methylated in the

environment by bacteria, particularly in sediments or other suitable environments. Methylated mercury can then enter the food chain, resulting in significant dietary exposure for predatory species, including humans. This is of particularly concern in relation to fish consumption. Several jurisdictions have established fish monitoring programmes and fish consumption advisories, especially around known, suspected or historical point sources of mercury emissions.

46. The risks associated with a particular site are related to both the level of contamination and the potential for exposure. A highly contaminated site that is isolated from population centres or that does not have significant leaching potential poses a much lower risk than a less contaminated site in an urban area or a site that is more closely linked to wetlands or with significant seepage into groundwater. Thus, site-specific clean-up targets will vary from site to site in accordance with the actual or projected exposure levels. The assessment of exposure requires consideration of both the level of mercury or mercury compounds on site and the migration of mercury off site, as well as proximity of the local population. This information may have been gathered during the process of site identification or may require additional sampling. Transfer and exposure models are available to assess the risk, and ongoing sampling should be undertaken over time to confirm that the situation is not deteriorating.

47. Depending on a site's history, many contaminants other than mercury might be present at levels justifying national-level concern. Information on such contaminants can also be gathered during the site assessment process. The presence of other substances (including other heavy metals, persistent organic pollutants or other hazardous substances) can affect management decisions, including choices in relation to possible remediation and remediation methods and the need to adopt risk management measures such as restricting access to the site and the surrounding area.

48. Lifestyle (tobacco use, diet, etc.) can also have an impact on how contaminants affect human health; it should be noted that they tend to affect economically disadvantaged people disproportionally.

E. Options for managing the risks posed by contaminated sites

49. Following assessment of a contaminated site, decisions are needed on the most appropriate means of managing the risks presented by the site. Such decisions can be taken at the national, regional or local level or, in certain circumstances, by landowners or other entities. The objective for managing the risks should be agreed in advance of action and should be consistent with the objective of the Minamata Convention in terms of protecting human health and the environment from the anthropogenic emissions and releases of mercury and mercury compounds. The requirements for contaminated site management may be set out in national legislation and policies.

50. There are two main ways of addressing site contamination resulting from previous industrial activities or other human activities: site management and site remediation. Site management is likely to be needed as an initial step after identifying the site and possible release/exposure routes, whether or not remediation is undertaken.

51. Site management includes actions taken to reduce exposure of humans and the environment to the mercury or mercury compounds present. An ongoing or primary source of contamination to ground or surface may need to be considered.

52. The actions taken may include restricting access to the site to limit direct exposure (through fencing and warning signs) or defining restrictions on any activities that might mobilize the contamination at the site. If there is no immediate danger to the environment or the local community, it may be considered suitable to leave the contaminated material untreated until higher priority sites have been addressed. It may be possible to isolate the contamination on-site in a containment facility pending later remediation. In such circumstances, the site contamination should be periodically reviewed to ensure that mercury is not migrating off site or developing the potential to affect the environment beyond the site boundaries. Care should also be taken to keep information on soil quality and other information on the site status readily available for future users of the site.

53. Long-term monitoring could be undertaken to determine any ongoing emissions and releases related to the presence of the contaminants and their metabolites. Soil sampling is likely to provide the best indication of the level of contamination; however, monitoring could also include measuring the atmospheric levels of mercury around the site. If ground or surface water contamination is identified in the initial assessment of the site, regular water sampling may also be considered as part of the management plan.

54. Site remediation is another way of reducing the risks associated with contaminated sites. Remediation includes actions taken to remove, control, contain or reduce contaminants or exposure

pathways. The goal of remediation is to render a site acceptable and safe for its current use and also to maximize potential future uses. The decision to remediate requires consideration of a number of factors, including the desired outcome, the level of contamination, the likely exposures resulting from the contamination, the feasibility of remediation options, cost-benefit considerations, the potential adverse effects of any actions (such as environmental contamination associated with disturbing contaminated soils) and the resources available for remediation. Remediation measures should also be undertaken with due consideration for the need to carry out such activities in a sustainable manner.

55. There are a number of remediation options available, with a range of effectiveness and cost. The choice of remediation method should take into account the declared use of the site and the risks associated with that use. The presence of other contaminants may also influence the choice of remediation method. It should be noted that a remediation strategy often requires the combination of several remediation techniques to address the issue properly. Evaluating and comparing individual remedial options to determine the most effective solution is a crucial aspect of assessing the environmental and health risks associated with a contaminated site.

Soil treatment

56. When feasible, on-site treatment to either remove the contaminant or reduce the associated hazard to an acceptable level may be preferable. As far as practicable, such treatment should be carried out without adverse effects on the environment, workers, the community adjacent to the site or the broader public.

57. On-site containment of the mercury-contaminated area may be a viable option in certain circumstances. Physical barriers are used to prevent mobilization of the mercury either through the soil or to air, with covering being a cost-effective physical barrier. This may involve cutting deep trenches into the soil around the contamination and filling the trenches with slurries (such as bentonite/cement and soil mixtures). It may also involve in situ injection of stabilization chemicals into the soil using specially designed augurs. Note that such actions do not reduce the mass of mercury present, and there is potential to release contaminated material during the process (Merly and Hube, 2014). Institutional controls such as deed restrictions or land record notices could be an effective complement to measures preventing mercury mobilization.

58. Excavation and other ground-disturbing activities at the site can be conducted within temporary air-tight structures using carbon filters and negative air pressurisation. This arrangement mitigates the risk of vapour and particulate releases that could harm local communities and the environment. Such structures can also be substituted for expensive ambient air monitoring programmes, as they provide greater confidence regarding exposure levels for workers and local residents.

59. If in situ treatment of the contaminated soil to remove the contamination is not feasible, another option is to excavate the contaminated soil and remove it from the site for treatment off site. It can be sent to an approved site or storage facility for later treatment. If this option is chosen, the Party would need to ensure that any receiving facility would be able to manage the waste in accordance with the provisions of the environmentally sound management of mercury wastes, as set out in article 11 of the Convention. Off-site treatment of the excavated soil aims to either remove the contaminant or reduce the associated hazard to an acceptable level. If possible, the treated soil is then sent back to the site or to another site. Soil treatment residues would presumably contain high mercury concentrations and would need to be managed as mercury waste. Note, too, that when contaminated soil is treated and disposed of off site, the conditions of the waste management unit can have an impact on treatment effectiveness.

60. Methods that have proved successful for treating mercury-contaminated soil include solidification and stabilization, soil washing and acid extraction, thermal treatment and vitrification (US EPA, 2007), as well as electrokinetics and in situ thermal desorption. The most suitable option will depend on the level of mercury and other contaminants in the soil, their distribution and the area that is contaminated. The treatment method should therefore be selected based on the site characteristics, taking into account the technologies that are available locally and nationally.

61. The solidification process involves mixing contaminated soil or waste with a binder to create a slurry, paste or other semi-liquid state that will cure into a solid form over time (US EPA, 2007). Solidification/stabilization can be done either on or off site. This technique has been used before for clean-up and is commercially available in some countries (US EPA, 2007). Several factors affect the performance or cost of this treatment technology, including the pH of the treated substance, the presence of organic compounds, particle size, moisture content and the oxidation state of the mercury present. Examples of binding compounds include Portland cement, sulphur polymer cement, sulphide,

phosphate, cement kiln dust, polyester resins and polysiloxane compounds. These compounds vary in their effectiveness in binding mercury. Mixing of mercury with sulphur can stabilize the mercury as mercury sulphide, which reduces leachability and volatility; however, mercury sulphide can be converted back to elemental mercury under certain circumstances. A polymer stabilisation process can be undertaken, where the mercury sulphide is microencapsulated in a polymeric sulphur matrix that forms solid blocks (UNEP, 2015). This two-stage process minimizes the environmental risks from the mercury but also the possibilities for extracting the mercury at a later stage.

62. Soil washing and acid extraction can be used on contaminated soils removed from the site and treated separately. As the name suggests, soil washing is a process in which the soil is washed to remove contaminants. Soil washing and acid extraction is primarily used to treat soils with a relatively low clay content that can be separated into fractions. It is also less effective for soils with high organic content. Performance and costs may further be affected by soil homogeneity, particle size, pH and moisture content.

63. Thermal treatment is used to treat industrial and medical waste that contain mercury, but it is generally not suitable for soils with high clay or organic content. Treatment performance and costs are affected by particle size and moisture content, among other things. It is a process in which heat is used to volatilize the mercury, which can then be collected from the off-gases. It is typically done off site. Any thermal treatment undertaken needs to provide for control of the mercury vapourized by the treatment. Thermal desorption can be done either directly or indirectly. Direct desorption involves the application of heat directly to the material to be treated. Indirect thermal desorption involves heating of the exterior of a chamber, which is passed through the wall of the chamber to the material for treatment. Indirect thermal desorption has the advantage of separating the off-gases of the treated material from the combustion gases, significantly reducing the volume of contaminated gases to be filtered. The off-gases from the treated material can be treated to recover mercury through, for example, condensation processes (Environment Agency, 2012). High-temperature thermal treatment in retort ovens operating at temperatures of around 425 to 540 degrees centigrade can be used for contaminated soils with a high concentration of mercury (US EPA, 2007). Note that emissions from incineration of waste are controlled under article 8 of the Minamata Convention, and the Conference of the Parties to the Minamata Convention has adopted guidance on best available techniques and best environmental practices for controlling and, where feasible, reducing emissions of mercury and mercury compounds to the atmosphere from various sources, including waste incineration.[5]

64. Electrokinetic applications use a low-intensity current in the contaminated soil. Such technology generally involves four processes: electromigration (transport of charged chemical species in the pore fluid), electro-osmosis (transport of pore fluid), electrophoresis (movement of charged particles) and electrolysis (chemical reaction associated with electric current). While these processes can extract metals from contaminated soils, their efficiency depends on many factors. The electrokinetic process can be difficult because mercury has a low solubility in most natural soils, and the process may be inhibited by the presence of elemental mercury (Feng and others, 2015).

Water treatment technologies

65. Contaminated sites should be assessed to determine the likelihood of groundwater or surface water contamination. An assessment of hydrogeological conditions can assist in this. If mercury has been identified in water associated with a contaminated site, there are several possible treatment technologies. These include precipitation/coprecipitation, adsorption and membrane filtration (US EPA, 2007). If bottom sediments are contaminated with mercury, excavation, removal and covering may be an appropriate treatment.

66. Precipitation/coprecipitation is a commonly used treatment, but requires a wastewater treatment facility and skilled operators. Its effectiveness is affected by pH and the presence of other contaminants. The process uses chemical additives that either turn dissolved contaminants into an insoluble solid (which will then precipitate) or form insoluble solids onto which dissolved contaminants are adsorbed. The liquid is then filtered or clarified to remove the solids.

67. Adsorption (often using activated carbon) is more often used for smaller systems where mercury is the only contaminant present. This process concentrates the mercury on the surface of a sorbent, which reduces the concentration in the bulk liquid phase. Generally, the adsorption media is packed into a column through which the contaminated water is passed. The spend adsorption media will then need to be regenerated for additional use or appropriately disposed of. This process is more likely to be affected by the presence of other contaminants than other methods.

[5] http://www.mercuryconvention.org/Portals/11/documents/forms%20and%20guidance/English/BATBEP_introduction.pdf

68. Membrane filtration is a highly effective process where the contaminants are removed from the water by passing it through a semi-permeable membrane. It is affected by other contaminants in the water, however, with suspended solids, organic compounds and other contaminants causing the membrane to work less efficiently or stop working altogether.

69. A decision to not take any immediate remediation action may allow for the development of new technologies that might make remediation more feasible in the future. In such cases, a long-term monitoring programme may be required, and a review process to consider possible future remediation could be put in place.

F. Evaluation of benefits and costs

70. All activities associated with contaminated site identification and assessment entail some level of cost. Such costs may include staff time for things like desk assessments for initial identification of possible contaminated sites and survey visits to inspect possible sites and collect samples to assess contamination levels. Sample analysis, whether through government or university laboratories or through private firms engaged to undertake the analysis, will also entail costs. There may also be private costs related to decreases in land value owing to the contamination, liability claims and reduced site functionality. The polluter-pays principle is a commonly accepted practice for covering costs. In cases where the polluter is absent or unknown, establishing a foundation can be an effective approach.

71. Public consultations may also entail costs associated with staff time or the hiring of a consultant or specialized firm.

72. Management or remediation of contaminated sites will entail costs, some of which will be one-off expenditures (capital costs) and some of which will be ongoing, such as operation, maintenance and monitoring costs. Actual costs will be very site specific and will depend on the availability of suitable technology nationally and local costs for consumables and labour.

73. The impact of mercury on the local population and the local environment also entails costs. Some of these costs are direct (such as medical care for people with adverse health effects), while others are more indirect (such as loss of income associated with contaminated fish that cannot be caught or sold, or lost cropland). The costs associated with the impact of a contaminated site on the local environment may be seen in the short or long term, but the benefits resulting from successful management of a contaminated site are seen for a very long period. Short-term costs can include the nuisance associated with remediation work, while longer-term costs can include a decrease in land value around the site and limitations on agricultural production or other land use. The costs to affected communities from non-market outcomes such as morbidity, brain damage and the loss of natural resources or clean water may be significantly higher. Such costs should be included in any economic assessments.

74. The costs associated with a number of possible remediation techniques have been assessed. Many of the available technologies have both initial capital costs and ongoing operation, maintenance and monitoring costs. Parties may establish national priorities to ensure that the available funds are used effectively. Such prioritization could be built on site ranking that uses a nationally agreed scoring system to identify the highest priorities. Extensive information is available on the applicability and possible risks of some of the available technologies, while more limited information is available for other, less mature technologies.

75. Management of a site does not imply that the site no longer has an impact on the environment or human health. Restricting access to a mercury-contaminated site may limit direct exposure to humans and animals but does not necessarily prevent groundwater contamination, the migration of contaminated dust off site or atmospheric contamination from mercury vapours. All of these impacts entail costs that should be considered in any assessment.

G. Validation of outcomes

76. In order to select the most appropriate options for managing the risks associated with a contaminated site, the objectives for managing the contaminated sites must be known. It is important to be able to verify whether the actions taken have been effective in meeting those objectives. The means of verification should be established during the initial planning process, and the resources needed to undertake any necessary actions such as monitoring should be included in the overall project.

77. The objectives of a monitoring programme will vary depending on the actions selected to manage the site. Success may be measured by a reduction in on-site mercury levels, in mercury entering the environment from the site or in the exposure of populations around the site, or the return of the site to some appropriate use. If there are indications that the site management actions are not meeting the overall project objectives, further action may be required. The management cycle of planning, implementing, evaluating, taking decisions and reorganizing may need to be followed in an iterative fashion, particular when considering any future action.

78. A common form of validation is site sampling validation. For instance, if a hotspot of mercury has been excavated, sampling of the walls and base of the excavated area should show levels of mercury below the remediation objectives in terms of mercury soil concentrations. Surface water concentrations, atmospheric concentrations and levels in biota can also be measured to assess whether management and/or remediation objectives have been met.

79. As part of the overall assessment of the initial actions taken to manage a contaminated site, further action such as remediation may be considered, particularly if technology advancements make this more feasible than at the time of the initial site assessment. In any event, ongoing monitoring of soil mercury levels may be needed, even after any remediation has been done.

H. Cooperation in developing strategies and implementing activities for identifying, assessing, prioritizing, managing and, as appropriate, remediating contaminated sites

80. Cooperation between and among parties is encouraged in the Convention text, both specifically in the article on contaminated sites and within the provisions of article 14 on capacity building, technical assistance and technology transfer.

81. Cooperation could include information-sharing activities, exploration of opportunities for joint assessment of sites, coordination of communication plans in relation to sites, and other activities as considered appropriate.

82. Opportunities for information-sharing may arise during the process of identifying contaminated sites, which may also present opportunities for joint site assessment. This may be particularly appropriate where, for example, there are a number of sites within a subregion that have been previously owned or managed by the same company or where similar activities are undertaken (such as mining or chlor-alkali production).

83. Cooperative activities during the assessment of contaminated sites can generate cost savings and efficiencies, particularly if parties are able to share the costs of sampling and analysis. It may be feasible, for example, for one party to consider taking on the task of obtaining samples that are then assessed by another party with greater laboratory capacity.

84. In terms of prioritization of contaminated sites, parties may take decisions based on national priorities; however, a cooperative approach involving information sharing and joint consideration of priorities may prove useful, particularly in situations where contamination is likely to have spread across national borders. The party with the greater impact from pollution can contribute useful information to the prioritization process. Additionally, parties may wish to cooperate where there are a number of contaminated sites in close proximity, such as is likely to be seen in areas where mining activities have been undertaken. Parties may need to cooperate to restrict access to certain sites. In cases where remediation activities are planned, it may be possible to develop joint plans with regard to the treatment of contaminated material, which may provide benefits of scale or allow treatment to be undertaken at specialized facilities.

85. There are a number of long-established regulator networks on contaminated land management. At the global level, the International Committee on Contaminated Land was formed in 1993. In the European Union, member States and the European Commission have collaborated in the Common Forum on Contaminated Land since 1994, initiating two concerted actions on risk assessment and risk management.[6] These initiatives have produced guidance documents on sustainable contaminated land management that are freely available for download at http://www.iccl.ch/ and https://www.commonforum.eu/.

[6] CLARINET – Contaminated Land Rehabilitation Network for Environmental Technologies (https://www.commonforum.eu/references_clarinet.asp), and CARACAS – Concerted Action for Risk Assessment for Contaminated Sites in Europe (https://www.commonforum.eu/references_caracas.asp).

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Appendix I

Further technical information

The guidance on the management of contaminated sites has been prepared as part of the process and possible options for the management of contaminated sites in line with article 12 of the Minamata Convention on Mercury. Additional technical information is available on many of the issues covered in the guidance and may be useful to those preparing action plans or undertaking management activities.

The links in the following list of resources appear as received from stakeholders and are provided for information purposes. The list may be updated without requiring a further decision by the Conference of the Parties.

Canada

Health Canada has developed guidance on environ .ntal and workplace health, available at https://www.canada.ca/en/health-canada/services/environmental-workplace-health/contaminated-sites/guidance-documents.html.

Information on health effects of mercury is available from Health Canada at https://www.canada.ca/en/health-canada/services/healthy-living/your-health/environment/mercury-human-health.html.

Technical information relating to drinking water guidelines is available at https://www.canada.ca/en/health-canada/services/publications/healthy-living/guidelines-canadian-drinking-water-quality-guideline-technical-document-mercury.html.

Appendix II

Framework and initial decision tree for management of contaminated sites

To be developed following the second meeting of the Conference of the Parties to the Minamata Convention on Mercury.

UNITED NATIONS

MC

UNEP/MC/COP.2/8

Distr.: General
25 September 2018

Original: English

United Nations Environment Programme

Conference of the Parties to the Minamata Convention on Mercury
Second meeting
Geneva, 19–23 November 2018
Item 5 (e) (i) of the provisional agenda*

Matters for consideration or action by the Conference of the Parties: operation of the financial mechanism: Global Environment Facility

Update on matters related to the Global Environment Facility Trust Fund

Note by the secretariat

1. In paragraph 5 of article 13, on the financial resources and mechanism, the Minamata Convention on Mercury defines a mechanism for the provision of adequate, predictable and timely financial resources to support developing-country parties and parties with economies in transition in implementing their obligations under the Convention. According to the Convention, the mechanism should include the Global Environment Facility Trust Fund and a specific international programme to support capacity-building and technical assistance.

2. The present note outlines matters with regard to the first entity[1] of the financial mechanism, namely the Global Environment Facility (GEF) Trust Fund, and is to be considered closely with the report of the Council of the Global Environment Facility to the Conference of the Parties to the Minamata Convention at its second meeting (UNEP/MC/COP.2/INF.3, annex). The executive summary of the report is reproduced in annex I to the present note. The annex is presented as received, without formal editing.

1. Global Environment Facility programming on mercury

3. GEF has provided programming support on mercury since the fifth replenishment period for the GEF Trust Fund. The GEF Council's report provides an account of GEF support to the Minamata Convention over the sixth GEF replenishment period: up to June 2018, GEF had provided support for a total of 110 countries to develop their Minamata Convention initial assessments and 32 countries to prepare their artisanal and small-scale gold mining national action plans. The report also gives an overview of the seventh GEF replenishment as concluded in April 2018 and endorsed by the GEF Council at its fifty-fourth meeting in June 2018.

4. The participants in the seventh replenishment of the GEF Trust Fund indicatively allocated $599 million to the chemicals and waste focal area, an amount representing 15 per cent of the total replenishment envelope. The amount of $206 million was indicatively allocated for mercury programming, significantly more than the sixth GEF replenishment figure of $141 million.

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* UNEP/MC/COP.2/1.

[1] UNEP/MC/COP.2/9 outlines matters relating to the second entity of the financial mechanism, namely the Specific International Programme to Support Capacity-building and Technical Assistance.

2. Cooperation between the secretariat of the Global Environment Facility and the secretariat of the Minamata Convention on Mercury

5. The Chief Executive Officer of GEF led a GEF secretariat delegation at the first meeting of the Conference of the Parties to the Minamata Convention, where she also participated in the high-level panel and hosted a high-level event on the GEF Global Opportunities for Long-term Development of the Artisanal and Small-scale Gold Mining Sector programme.

6. Building on the close cooperation developed between the GEF secretariat and the interim secretariat of the Minamata Convention following the adoption of the Convention in 2013, the GEF secretariat and the secretariat of the Minamata Convention have continued to work closely together since the first meeting of the Conference of the Parties.

7. The principal coordinator of the interim secretariat attended the fifty-third meeting of the GEF Council, held in Washington, D.C., in November 2017, and addressed the Council on the outcomes of the first meeting of the Conference of the Parties. A senior representative of the secretariat also participated in the dialogue with multilateral environmental agreement secretariats held during the meeting. The Executive Secretary attended the fifty-fourth meeting of the GEF Council and sixth meeting of the GEF Assembly, held in Viet Nam in June 2018. She addressed the Council during the session on relations with the multilateral environmental agreements and the Assembly in plenary. She was also able to address a number of the constituency meetings preceding the Council meeting. She participated in the round table on chemicals and waste and the side event on the GEF Global Opportunities for Long-term Development of the Artisanal and Small-scale Gold Mining Sector programme. The Executive Secretary and a senior representative of the secretariat also participated in the regular chemicals and waste task force meeting organized by the GEF secretariat. The Executive Secretary and a senior representative of the secretariat also met with the Chair of the Scientific and Technical Advisory Panel and her senior staff and with the GEF Indigenous Peoples Advisory Group.

8. In relation to making information on the various projects funded by GEF for the implementation of the Minamata Convention publicly available, the secretariat of the Minamata Convention makes an online searchable project database available on its website.[2] Information on many GEF-funded projects related to the Convention is already accessible and the database will be expanded as project reports become available, including those for completed enabling activities. The secretariat has also been requested by the GEF secretariat to host the database of all Minamata Convention initial assessments and associated data.

3. Guidance to the Global Environment Facility on overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources, and on an indicative list of categories of activities that could receive support from the Global Environment Facility Trust Fund

9. Paragraph 7 of article 13 of the Convention stipulates that the GEF Trust Fund is to provide new, predictable, adequate and timely financial resources to meet costs in support of implementation of the Convention, as agreed by the Conference of the Parties. It is to provide resources to meet the agreed incremental costs of global environmental benefits and the agreed full costs of some enabling activities. Paragraph 7 further stipulates that for the purposes of the Convention, the GEF Trust Fund is to be operated under the guidance of and be accountable to the Conference of the Parties. The Conference of the Parties is to provide guidance on overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources, as well as on an indicative list of categories of activities that could receive support from the GEF Trust Fund.

10. At its first meeting, the Conference of the Parties adopted decision MC-1/5 on guidance to GEF. The annex to the decision sets out guidance on overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources and on an indicative list of categories of activities that could receive support from the GEF Trust Fund.

11. The secretariat forwarded the adopted guidance to the GEF Council, as requested by the Conference of Parties, through the GEF secretariat. The GEF Council took note of the guidance at its fifty-third meeting, in November 2017, and has provided a response in its report to the Conference of the Parties at its second meeting (UNEP/MC/COP.2/INF3, annex).

[2] http://www.mercuryconvention.org/Implementation/Projectsdatabase.

4. Draft memorandum of understanding between the Conference of the Parties to the Minamata Convention and the Council of the Global Environment Facility

12. In paragraph 2 of its resolution on financial arrangements of the Convention, the Conference of Plenipotentiaries on the Minamata Convention on Mercury, which met in Kumamoto and adopted the Convention, decided that the intergovernmental negotiating committee to prepare a global legally binding instrument on mercury should develop a draft memorandum of understanding between the Conference of the Parties and the GEF Council on arrangements to give effect to the relevant provisions of paragraphs 5 to 8 of article 13, for consideration by the Conference of Parties at its first meeting. The draft memorandum of understanding was subsequently developed, agreed to on a provisional basis during the final session of the intergovernmental negotiating committee in March 2016 and sent to the GEF Council for its final consideration. The GEF Council considered the draft memorandum of understanding at its fifty-first meeting and directed the GEF Secretariat to transmit it, along with any comments from the Council, to the Conference of the Parties. The draft memorandum of understanding was presented to the Conference of the Parties at its first meeting for its consideration.

13. During the consideration of the matter by the Conference of the Parties, one representative, speaking on behalf of a group of countries, proposed adopting the draft memorandum of understanding, noting that it had been approved by the intergovernmental negotiating committee. Supporting the proposal, another representative noted that the memorandum was not legally binding and had been discussed in detail. Yet another representative said that additional discussions were required and proposed specific amendments. The Conference of the Parties deliberated further on the matter during the meeting and subsequently agreed to defer further consideration of the matter to its second meeting.

14. The GEF Council subsequently noted the matter of the draft memorandum at its fifty-third meeting, in November 2017. At that meeting, the GEF legal counsel noted that, according to the Instrument for the Establishment of the Restructured Global Environment Facility, as amended by the Fifth GEF Assembly in May 2014, GEF was to operate as one of the entities comprising the financial mechanism of the Minamata Convention on Mercury, and to operate under the guidance of and be accountable to the Conference of the Parties. The GEF legal counsel also noted that a memorandum of understanding was not a strict prerequisite for GEF to fulfil its role as part of the financial mechanism for the Convention.[3]

15. Subsequent to the first meeting of the Conference of the Parties, the matter of the draft memorandum of understanding was also considered by the principal legal advisor of the United Nations Environment Programme, who noted that while there was no express requirement under the Convention that a memorandum of understanding be concluded between the Conference of the Parties and the GEF Council, it was for the Conference of the Parties to decide whether such a memorandum was necessary. As such, the matter remains open for the Conference of the Parties to consider.

16. While the memorandum of understanding is not legally binding, the Conference of the Parties and the GEF Council may consider it useful to have a memorandum of understanding to provide for administratively sound, substantive collaboration between them in the long term. In this regard, it should be noted that in addition to the standard subheadings (e.g., definitions, purpose, amendments, interpretation, entry into force and termination), the draft memorandum of understanding contains subheadings on guidance from the Conference of the Parties, conformity with guidance from the Conference of the Parties, reporting, monitoring and evaluation, cooperation between the secretariats and reciprocal representation.

5. Review of the financial mechanism of the Minamata Convention on Mercury

17. Paragraph 11 of article 13 of the Convention stipulates that the Conference of the Parties is to review, no later than at its third meeting and thereafter on a regular basis, the level of funding, the guidance provided by the Conference of the Parties to the entities entrusted to operationalize the mechanism, the effectiveness of those entities and their ability to address the changing needs of developing-country parties and parties with economies in transition. Based on its review, the Conference of the Parties is to take appropriate action to improve the effectiveness of the financial mechanism.

[3] See para. 33 of "Highlights of the Council's discussions" at http://www.thegef.org/sites/default/files/council-meeting-documents/HIGHLIGHTS_53rd_Council_Meeting.pdf.

Suggested action by the Conference of the Parties

18. The Conference of Parties may wish to consider the draft memorandum of understanding as presented at its first meeting (UNEP/MC/COP.1/15, annex) and as reproduced in annex II to the present note.

19. In the light of the requirement in the Convention that the Conference of the Parties review the financial mechanism established under article 13 no later than at its third meeting, the Conference of the Parties may wish to identify at its second meeting how the GEF Trust Fund component of that review might be undertaken and the information required for such a review, and to request GEF, the secretariat of the Minamata Convention and others, as necessary, to provide the information required for consideration of the matter at its third meeting.

20. Furthermore, the Conference of the Parties may wish to include in the above-mentioned review consideration of the memorandum of understanding, if the matter is not resolved at the second meeting.

21. The Conference of the Parties may also wish to discuss how to assess whether it needs to prepare additional guidance as input to the consideration of the eighth GEF replenishment in 2021.

Annex I

Executive summary of the report of the Council of the Global Environment Facility to the Conference of the Parties to the Minamata Convention on Mercury, as submitted by the secretariat of the Global Environment Facility

1. Executive summary of the Report of the Global Environment Facility to the Second meeting of the Conference of the Parties to the Minamata Convention on Mercury, as submitted by the Secretariat of the Global Environment Facility

2. The Minamata Convention on Mercury is the most recent Convention in which the Global Environment Facility (GEF) in included in the Financial Mechanism.

3. The objective of the Convention is to protect the human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds.

4. Article 13 of the Minamata Convention includes the GEF in the Financial Mechanism to provide new, predictable, adequate and timely financial resources to meet costs in support of implementation of this Convention as agreed by the Conference of the Parties.

5. The Minamata Convention was added to the Instrument for the Establishment of the Restructured Global Environment Facility during the Fifth Assembly of the Global Environment Facility in May 2014.

6. This report presents the work of the GEF in fulfilling its mandate under the Minamata Convention between July 1, 2017 and June 30, 2018 and responds to the guidance to the GEF from the first meeting of the Conference of the Parties (COP 1) to the Minamata Convention on Mercury that took place from September 24 to 29, 2017. The guidance is contained in the annex to the Minamata COP decision MC-1/5.

7. The report additionally provides an account of the GEF's support to the Minamata Convention on Mercury over the sixth replenishment period (GEF-6) of July 1, 2014 to June 30, 2018, as well as an overview of the results of the seventh GEF replenishment (GEF-7) process.

8. Since the first COP in September 2017, the GEF has approved two full-sized projects (FSPs) covering seven countries and seven enabling activity projects covering ten countries.

9. The resources committed during the reporting period is $8.25 million.

10. The sixth replenishment of the GEF (GEF-6) committed $554 million of GEF resources for chemicals and waste focal area, of which $141 million was allocated to the implementation of the Minamata Convention.

11. During GEF-6, $148.7 million was programmed to implement the Minamata convention of which $134 million was allocated to countries, $2 million to project preparation and $12.5 million to agency fees.

12. The GEF-6 resources supported 85 countries to conduct Minamata Initial Assessments (MIA), which brings the total number of countries that received MIA support to date to 110.

13. In GEF-6, National Action Plans for Artisanal and Small-Scale Gold Mining (NAP) were also supported, with 32 countries receiving support.

14. Twenty-six (26) countries received support for implementation activities through programmatic approaches, FSP and medium-sized projects in GEF-6.

15. On average, excluding enabling activities, the portfolio leveraged four dollars for every GEF dollar invested from co-financing.

16. The corporate target for mercury reduction in the GEF-6 period was 1,000 metric tons. The Corporate Scorecard presented at the 54th GEF Council meeting in June 2018 showed that the GEF-6 mercury projects approved contributed 638 tons, or 64 percent of the GEF-6 corporate target for mercury reduction.

Annex II

Draft memorandum of understanding between the Conference of the Parties to the Minamata Convention on Mercury and the Council of the Global Environment Facility

The Conference of the Parties to the Minamata Convention on Mercury (hereinafter the "Conference of the Parties") and the Council of the Global Environment Facility (hereinafter the "Council"),

Recalling paragraph 5 of Article 13 of the Convention, which defines a Mechanism for the provision of adequate, predictable and timely financial resources to support developing-country Parties and Parties with economies in transition in implementing their obligations under the Convention, and paragraph 6 of Article 13, which establishes that the Mechanism "shall include the Global Environment Facility Trust Fund; and a specific international Programme to support capacity-building and technical assistance";

Recalling also paragraph 7 of Article 13 of the Convention, which states that the Global Environment Facility Trust Fund "shall provide new, predictable, adequate and timely financial resources to meet costs in support of implementation of this Convention as agreed by the Conference of the Parties" and that it "shall be operated under the guidance of and be accountable to the Conference of the Parties", which "shall provide guidance on overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources" as well as "guidance on an indicative list of categories of activities that could receive support from the Global Environment Facility Trust Fund";

Recalling further paragraph 7 of Article 13 of the Convention, which stipulates that the Global Environment Facility Trust Fund "shall provide resources to meet the agreed incremental costs of global environmental benefits and the agreed full costs of some enabling activities", and paragraph 8 of Article 13, which specifies that in providing resources for an activity, the Global Environment Facility Trust Fund "should take into account the potential mercury reductions of a proposed activity relative to its costs";

Recalling paragraph 6 of the Instrument for the Establishment of the Restructured Global Environment Facility, as amended at the fifth Assembly of the Global Environment Facility, held in May 2014, which provides that the Global Environment Facility will "[o]perate as one of the entities comprising the financial mechanism of the Minamata Convention on Mercury…";

Having consulted each other and taking into account the relevant aspects of their governance structures as reflected in their constituent instruments,

Have reached the following understanding:

Definitions

1. For the purpose of the present memorandum of understanding:

(a) "Assembly" means the Assembly of the Global Environment Facility (GEF) as defined in the Instrument for the Establishment of the Restructured Global Environment Facility;

(b) "Conference of the Parties" means the Conference of the Parties to the Minamata Convention on Mercury;

(c) "Convention" means the Minamata Convention on Mercury;

(d) "Council" means the Council of the GEF as defined in the Instrument for the Establishment of the Restructured Global Environment Facility;

(e) "GEF" means the mechanism established by the Instrument for the Establishment of the Restructured Global Environment Facility;

(f) "GEF Instrument" means the Instrument for the Establishment of the Restructured Global Environment Facility;

(g) "Party" means Party to the Minamata Convention on Mercury; and

(h) "Mercury" means the substances covered under the Minamata Convention on Mercury.

Purpose

2. The purpose of the present memorandum of understanding is to make provision for the relationship between the Conference of the Parties and the Council in order to give effect to the provisions relating to the GEF Trust Fund in paragraphs 5, 6, 7, 8, 10 and 11 of Article 13 of the Convention and paragraphs 6, 26 and 27 of the GEF Instrument.

Guidance from the Conference of the Parties

3. The Conference of the Parties will provide GEF with appropriate guidance in accordance with paragraph 7 of Article 13 of the Convention. The guidance will address overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources, as well as an indicative list of categories of activities that could receive support from the GEF Trust Fund. No later than at its third meeting, and thereafter on a regular basis, the Conference of the Parties will review such guidance pursuant to paragraph 11 of Article 13 and may on the basis of such review decide to update or revise it. Subsequently, the Conference of the Parties will agree with GEF upon any additional arrangements beyond the present memorandum of understanding that may be necessary.

Conformity with guidance from the Conference of the Parties

4. The Council will ensure the effective operation of GEF as a source of funding for activities for the purposes of the Convention in conformity with the guidance provided to it by the Conference of the Parties.

5. The Council may raise with the Conference of the Parties any matter arising from the guidance adopted by the Conference of the Parties. In particular, if the Conference of the Parties provides guidance to GEF subsequent to its first meeting, the Council may consult with the Conference of the Parties to update and clarify existing guidance in light of any new or additional guidance that it receives.

6. Funding decisions for specific projects and activities should be agreed between the developing-country Party or the Party with an economy in transition concerned and GEF in accordance with the overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources established by the Conference of the Parties. The GEF Council is responsible for approving the GEF work programmes. If a Party considers that a decision of the Council regarding a specific project is not consistent with the guidance provided by the Conference of the Parties in the context of the Convention, and if after consideration the Conference of the Parties decides that the concern of the relevant Party has merit, the Conference of the Parties will seek clarification from GEF and analyse the observations presented to it by the concerned Party and the response by GEF. In the event that the Conference of the Parties considers that the project decision by the GEF Council is not consistent with the overall strategies, policies, programme priorities and eligibility for access to and utilization of financial resources established by the Conference of the Parties, it may request GEF to propose and implement a course of action to address the concern regarding the project in question.

Reporting

7. In order to meet the requirements of accountability to the Conference of the Parties, the Council will prepare and submit reports for consideration by the Conference of the Parties at each of its ordinary meetings. The reports of the Council will be official documents of the meetings of the Conference of the Parties.

8. The reports of the Council will include information on GEF activities related to the Convention and on the consistency of those activities with the guidance provided by the Conference of the Parties, as well as any decision of the Conference of the Parties communicated to GEF, under Article 13 of the Convention.

9. In particular, the reports will provide:

(a) Information on how GEF has responded to the guidance provided by the Conference of the Parties, including, where appropriate, through the incorporation of the guidance into the strategies and operational policies of GEF;

(b) A synthesis of projects approved by the Council and projects being implemented during the reporting period in relation to mercury, with an indication of GEF and other resources allocated to each such project and the implementation status of each project;

(c) In the case of any project proposal included in a work programme that is not approved by the Council, an explanation of why it was not approved.

10. The Council will also report on GEF monitoring and evaluation activities concerning projects in the chemicals and waste focal area in relation to mercury.

11. The Council will also provide information on other matters concerning the discharge of functions under paragraph 5 of Article 13 as it relates to the GEF Trust Fund as may be requested by the Conference of the Parties. If the Council has difficulties in responding to any such request, it will explain its concerns to the Conference of the Parties, and the Conference of the Parties and the Council will find a mutually acceptable solution.

12. The Council will include in its reports to the Conference of the Parties any views that it may have regarding the guidance provided by the Conference of the Parties.

13. The Conference of the Parties may raise with the Council any matter arising from the reports received from the Council and seek GEF clarification and explanation.

Monitoring and evaluation

14. As provided for in paragraph 11 of Article 13 of the Convention, the Conference of the Parties will review, no later than at its third meeting, and thereafter on a regular basis, the level of funding, the guidance provided by the Conference of the Parties to GEF as one of the two entities entrusted to operationalize the Mechanism established under Article 13, and the effectiveness of GEF and its ability to address the changing needs of developing-country Parties and Parties with economies in transition. The Conference of the Parties shall, based on such review, take appropriate action to improve the effectiveness of the Mechanism.

15. In preparing its review of GEF as one of the two entities of the financial Mechanism under the Convention, the Conference of the Parties will, as appropriate, take into account the reports of the GEF Independent Evaluation Office and the views of GEF. The GEF Independent Evaluation Office will consult, as appropriate, the secretariat of the Convention when preparing evaluations of the activities of GEF related to mercury.

16. The Conference of the Parties will, on the basis of the above-mentioned reviews, communicate to the Council relevant decisions taken by the Conference of the Parties as a result of such reviews to improve the performance and effectiveness of GEF in assisting developing-country Parties and Parties with economies in transition in the implementation of their obligations under the Convention.

Cooperation between secretariats

17. The secretariat of the Convention and the secretariat of GEF will communicate and cooperate with each other and consult on a regular basis to facilitate the effectiveness of GEF in assisting developing-country Parties and Parties with economies in transition to implement their obligations under the Convention.

18. In particular, in accordance with the GEF project cycle the secretariat of the Convention will be invited to comment on the project proposals related to mercury under consideration for inclusion in a proposed work programme, especially with regard to their consistency with the guidance provided by the Conference of the Parties.

19. The secretariats of the Convention and GEF will consult each other on draft texts of documents relevant to both the Convention and GEF prior to issuing the final texts of such documents and take any comments into account in their finalization.

20. Official documentation of GEF, including information on project activities, and of the Convention will be made available on the respective websites of GEF and the Convention.

Reciprocal representation

21. On a reciprocal basis, representatives of GEF will be invited to attend meetings of the Conference of the Parties and relevant subsidiary bodies as appropriate, and representatives of the Convention will be invited to attend meetings of the Council and Assembly and other relevant meetings.

Amendments

22. The present memorandum of understanding may be amended at any time by written consent between the Conference of the Parties and the Council.

Interpretation

23. If differences arise in the interpretation of the present memorandum of understanding, any issue may be referred, as appropriate, to the Conference of the Parties and the Council of GEF for consideration. The Conference of the Parties and the Council will make every effort to reach a mutually acceptable solution.

Entry into effect

24. The present memorandum of understanding will enter into effect upon approval by the Conference of the Parties and by the Council.

Termination

25. Either the Conference of the Parties or the Council may terminate the present memorandum of understanding at any time upon written notification to the other. The termination will take effect six months after such notification and will not affect the validity or duration of activities authorized before such termination.